THE ACTIVITY CENTER FOR LEFT-BEHIND CHILDREN IN RURAL HUNAN

By
Mrs. Xiaocui LI

A Thesis Submitted in Partial Fulfillment of the Requirements
for Doctor of Philosophy DESIGN
Silpakorn University
Academic Year 2023

โดย
Mrs.Xiaocui LI

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปรัชญาดุษฎีบัณฑิต
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Title	The Activity Center for Left-Behind Children in Rural Hunan
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Advisor	Assistant Professor Dr. Vanvipha Suneta

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Left-behind children live in rural areas for extended periods because their parents or guardians are away working. These children need a safe, comfortable place with learning and recreational functions to help them get through a long and lonely life. This research focuses on designing activity centers for left-behind children in the Hunan region. Integrating knowledge from several fields, including regional culture, child psychology, and child pedagogy, provides left-behind children with a safe, attractive, educational, and regionally-specific activity place.

This study adopts a mixed research method, including a literature review, field survey, observation method, questionnaire survey, and expert review. First, the situation of left-behind children in rural Hunan was analyzed using a literature review to summarize the relevant features of left-behind children's characteristics, Hunan's regional characteristics, and the influence of activity centers on the growth of left-behind children. Second, the actual condition of abandoned children in rural Hunan was extensively investigated, and their recreational, social, educational, and emotional requirements were explained. The interaction between them and the spatial environment was then compiled and assessed using design experiments, and the primary aspects of the design scheme, namely the relationship between left-behind children, the environment, and the space, were presented. The basic principles and steps of the design were also determined, and the design method and expert evaluation system were developed. Finally, the feasibility of the design methodology is demonstrated through design practice, and feedback is obtained using exhibition and expert evaluation.

In summary, the design of activity centers for left-behind children needs to consider children's needs and regional cultural characteristics fully. This research presents a set of design concepts and techniques for the design of activity centers for left-behind children in Hunan to fulfill the requirements of the children, as well as a valuable reference for the creation of future comparable projects. Paying full attention to children's needs and regional cultures can create a better-growing environment for left-behind children to promote their overall development.

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Xiaocui LI

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1.1 Background and Importance of the Study

Left-behind children are minor children who have lived in their original residence or hometown for a long time because their parents or guardians have been working or living abroad for a long time. They are often in a state of family absence and separation of family members, lacking family and social care and supervision, and face problems such as mental health issues, declining academic performance, and behavioral problems.

According to estimates, the number of left-behind children in China had surpassed 29 million as of 2021, with over 70% residing in rural regions. Loneliness, depressive symptoms, and addiction to the Internet and gaming are some of the issues left-behind children face in their psychological, educational, health, and social relationships. Because of a lack of family education, kids may acquire undesirable behaviors such as theft, early love, and smoking. The problem of abandoned children has become one of the most contentious issues in Chinese culture. Measures to care for and assist left-behind children are gaining popularity to help these youngsters grow healthy.

China's Thoughts on Building the Care and Security of Children Left Behind in Rural Regions set out the overall goal of strengthening the protection and care of children left behind in rural areas, needing that by 2020 (council, 2016), the legal and organizational system for the protection of minors will be more complete, the entire society's awareness to care for and protect children will be generally enhanced, and the environment for children to grow up will be improved. The occurrence of children left behind will be considerably decreased.

1.1.1 The Population of Left-Behind Children is Significant

According to data from the National Bureau of Statistics of China, the population change of left-behind children in China during the last ten years (Figure 1) and the population change of left-behind children in Hunan Province (Figure 2).

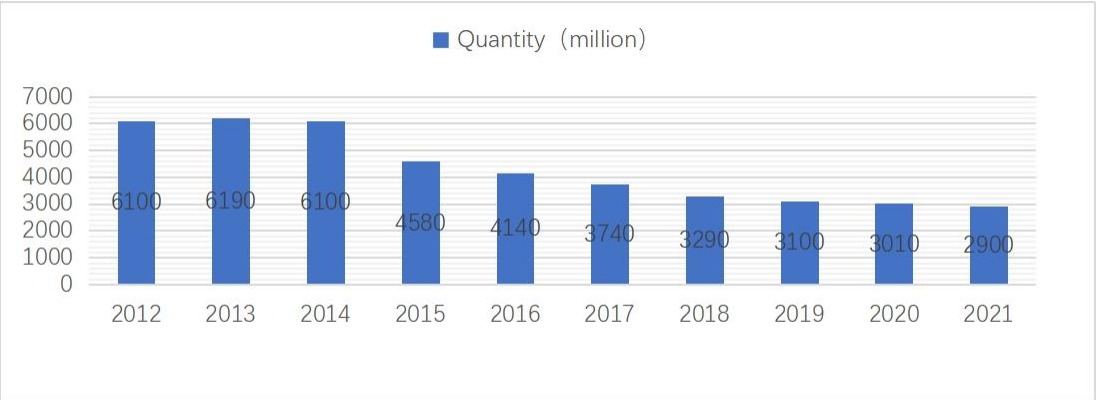

Figure 1 Change in the number of left-behind children in China during the last ten years

Source: China National Knowledge Infrastructure,2022

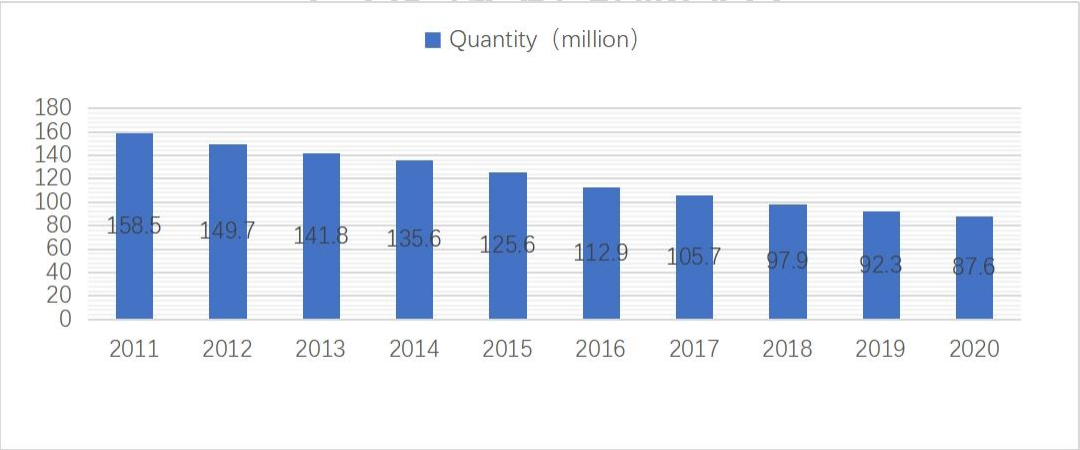

Figure 2 Hunan Province's population of left-behind children has changed during the last ten years

Source: China National Knowledge Infrastructure,2022

It can be observed that the number of left-behind children in China and Hunan Province during the last ten years, despite the overall trend of reducing by 0.95% per year, is still enormous and attracts widespread attention from all walks of life. Among them, 2011–2013 had the most significant number of left-behind children in China, which may be connected to the pattern of rural population shift and uneven urban-rural growth in China at the time. After the previous year, the number of children left behind in Hunan Province decreased annually, reaching fewer than one million in

2018. As a result, addressing the issue of left-behind children necessitates the ongoing attention and engagement of all sectors of society, as well as extensive study.

1.1.2 Challenges to Left-Behind Children's Growth Environment in Rural Areas

Poverty, instability, social alienation, mental stress, and social isolation affect many left-behind children in China. They live in a nasty social environment without parental love, care, and supervision, and their childhood is fraught with difficulties.

The first is the importance of family education. The majority of rural left-behind parents work in cities. They cannot take care of their children personally, resulting in a lack of parental care and education. This makes the children susceptible to behavioral habits and psychological problems under the influence of family education. Then there is the poor social environment. Families with left-behind children in rural locations are typically impoverished, lacking cultural, recreational, and sports-related social backgrounds and resources, negatively impacting children's physical and mental development. Again, more learning resources are required. Rural schools have limited teaching resources, and the quality of instructors and instructional facilities has to be improved, affecting children's academic performance and growth. Lastly, there needs to be more safety and security. Rural abandoned children are typically left alone at home or in the care of their grandparents, and they are vulnerable to all kinds of accidental injuries and evil influences and lack safety and security. Without an improved environment to grow up, they are more likely to become victims of social injustice.

Furthermore, they are predisposed to health and psychological issues such as sadness, anxiety, and suicide ideation. These issues provide significant obstacles and challenges to the healthy development of rural left-behind children. Thus, proactive actions are required to improve their living environment and quality of life. Frost said that play is the main carrier of one's early learning and development. Providing more activity spaces for rural left-behind children, as well as a place with safe and well-managed out-of-school activities, keeping them away from Internet cafes and games, and providing good conditions for their physical and mental health and growth, is an effective solution to the problem of left-behind children (Jiali, 2019).

As a result, activity spaces aim to offer a safe atmosphere for children's healthy development and outdoor activities and support their growth. Secure children's activity centers are incredibly vital and required for rural left-behind children, and how to provide them with a safer, healthier, and more active growing environment has become a challenge that modern designers must confront.

1.1.3 Children's Needs Are Ignored During Rural Construction

The countryside in rural China is primarily focused on the needs of adults, and disregard for the needs of children is a widespread concern.

First of all, schools in rural areas lack educational resources, and the quality of teachers and teaching equipment is not high enough, so children cannot enjoy the same educational resources as in the cities. Secondly, the lack of cultural and recreational facilities in most rural areas prevents children from engaging in colorful activities. Finally, left-behind children lack supervision, and many rural children face safety hazards, such as drowning, disappearance, and traffic accidents. These problems have resulted in many children in rural areas not being able to enjoy the basic rights and resources that urban children have, which are crucial to their growth and development. Therefore, in the process of rural construction, attention should be paid to solving the problems and needs faced by children and building a more suitable rural environment for children's growth.

As a result, the researcher focuses on the influencing factors and design principles of rural left-behind children's activity centers, as well as the related design methods, to propose practical solutions for the design of rural left-behind children's activity centers and contribute to the resolution of China's left-behind children problem.

1.2 Research Objectives

1.2.1 To study the current status and difficulties of Hunan's rural left-behind children, to comprehend their social, educational, and emotional requirements, and to serve as a foundation for creating activity centers for them.

1.2.2 To explore how to integrate Hunan's regional characteristics and cultural elements into the design of activity centers to provide richer experiences and learn opportunities for left-behind children.

1.2.3 Create activity center programs for left-behind children in rural Hunan to improve their interpersonal abilities, education, and emotional health while supporting their development and growth.

1.3 Research Questions

1.3.1 What constitutes the actual condition and need of left-behind children in rural Hunan?

1.3.2 What are the functional needs of the activity centers for left-behind children?

1.3.3 How to design the activity center for left-behind children with Hunan characteristics by combining Hunan's locality?

1.4 Research Significance

1.4.1 Theoretical Significance

1.4.1.1 Encourage in-depth study on the issue of left-behind children. The topic of abandoned children is a current source of societal concern. The study of the design of activity centers for left-behind children in rural Hunan can bring answers to the local problem of left-behind children and new ideas and perspectives for left-behind children research.

1.4.1.2 Promote the notion of caring for children who have been left behind. The activity center design study for left-behind children can support the popularization and promotion of caring for left-behind children, thus increasing society's concern and care for left-behind children.

1.4.1.3 Encourage the growth of social welfare initiatives. The Hunan rural left-behind children's activity center's design study not only focuses on the lives and education of left-behind children but is also a component of public social welfare, which supports the growth and improvement of general social interest.

1.4.2 Application Value

1.4.2.1 Provide better education and living conditions for left-behind children. The activity center for left-behind children design research can provide better education and living situations for left-behind children in rural parts of Hunan, allowing them to grow and develop more effectively.

1.4.2.2 Promote the experience and model of rural areas in Hunan. The research on the design of activity centers for left-behind children in remote Hunan can serve as a model for other areas, promote the model and experience of activity centers for left-behind children in remote Hunan, and help to solve the national problem of left-behind children.

1.4.2.3 Increase social concern and care for underprivileged children. Constructing activity centers for left-behind children can increase societal problems and care for these youngsters while promoting the growth of social welfare endeavors.

1.5 Research Framework

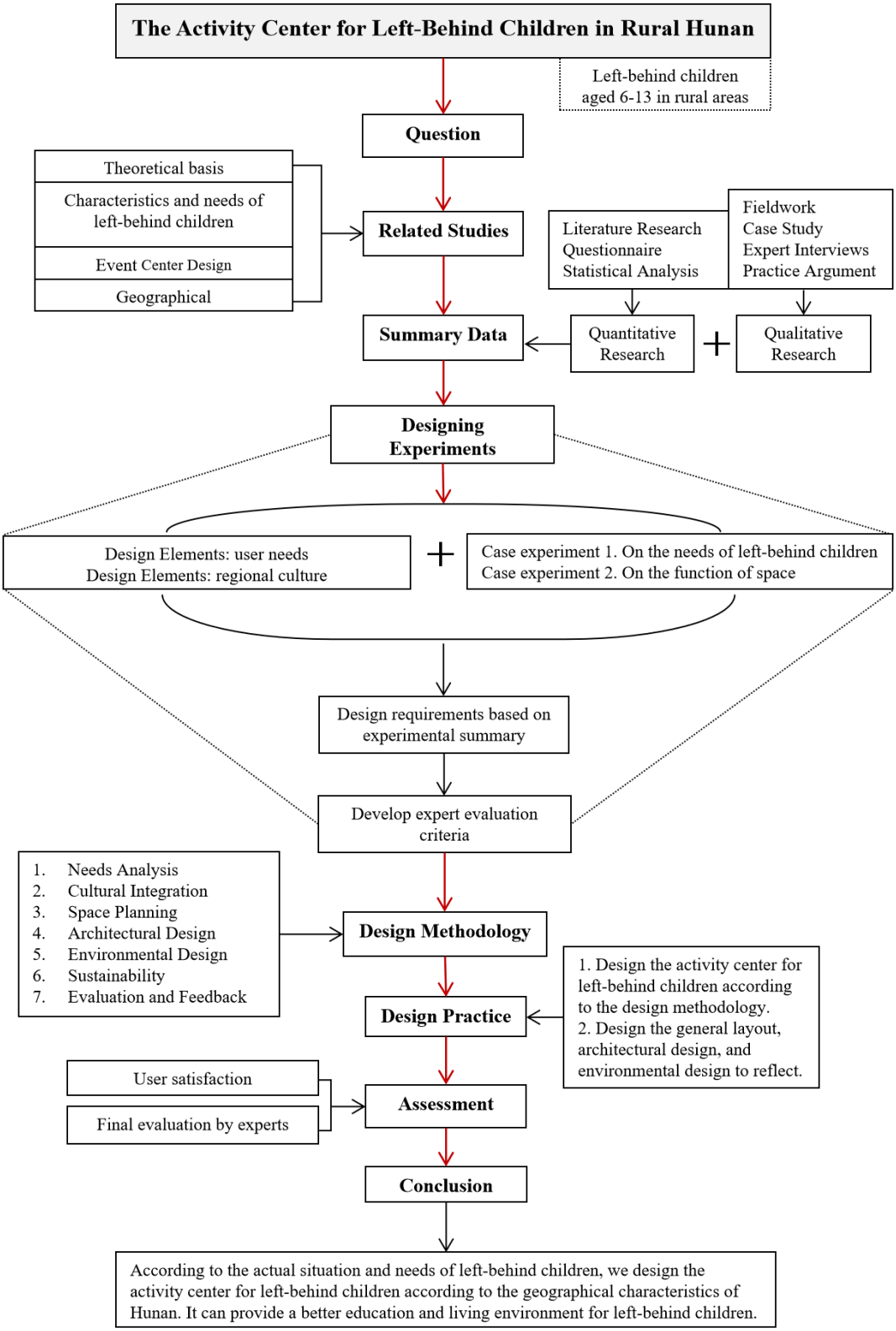

Figure 3 Research framework diagram

Source: Self-drawn by the author, 2023

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1.6.1.2 Results of the case study.

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1.7 Definition of Terms

1.7.1 Left-Behind Children

Children who have been abandoned in their hometowns because one or both parents have gone to work must be nurtured and cared for by other relatives or friends (Zhiqiang et al., 2013). Scholars disagree on how to define the age of left-behind children. Some feel that children under the age of 16 should be left behind; others believe that left-behind children are those under 18; and other researchers have defined the lower limit of left-behind children as those aged 6–16 years (Jiyu, 2015).

1.7.2 Children's Activity Center

Children's Activity Center is a cultural building that provides children with extracurricular leisure activities but also combines children's knowledge and interests. It evolved from the Children's Museum from the late 1800s to the early 1900s and the Soviet Union's Children's Palace. It can serve as the foundation for children's activity centers. With the development of society, children's activity centers have gradually developed into comprehensive children's educational buildings with increasingly complex functions. It differs from hospitals and schools as a particular building type but is generalized and covers a broader range (Chiyi, 2018).

1.7.3 Architectural Regionality

The regionality of architecture, or locality, refers to the specific relationship between architecture and its location's natural conditions, economic form, cultural environment, and social structure (Heath, 2009). It is an essential attribute of architecture. The regionality of architecture has existed since it was produced (Neuman, 2000), and it is an inherent attribute of architecture. The regionality of architecture is the result of the interaction and balance between a region's architectural form and the region's natural and social conditions (Wenrui & Junping, 2009).

Chapter 2 Literature Review and Related Studies

The purpose of this design project was to develop ways to create regional activity centers for left-behind children. The literature review aims to give theoretical guidelines for activity center design.

(1) To design activity centers for left-behind children with Hunan characteristics in response to the needs of the target population and to provide new ideas and methods for the study of children who are left behind.

(2) To develop and describe activity centers for left-behind youngsters to aid designers in fulfilling the demands of the target group. Therefore, this literature review focuses on finding regional design methods for activity centers for left-behind children that meet the needs of the target population. A review of relevant literature was conducted, including research questions, objectives, methods, and results. The relevant items are as follows:

Part 01: To examine the relevant theoretical foundations guiding the design and practice of activity centers for children who are left behind.

Part 02: Concepts and theories related to left-behind children.

Part 03: Concepts and theories related to the design of activity centers.

Part 04: Concepts and theories related to Hunan localities.

Part 05: Related Studies.

Part 06: Summary.

2.1 Relevant Basic Theories

2.1.1 Environmental Psychology

Environmental psychology, a formal discipline in the 1960s, analyzes the interrelationship between human behavior and the environment in which people live. Human behavior is an external reflection of psychological needs, and although there are individual differences, there are also commonalities between human behavior and psychology in the environment. Environmental psychology theory can enable us to clearly understand the connection between ourselves and the environment, which can better follow the developmental laws of the human body and nature, bring into play human subjective initiative, and make the environmental design more in line with individual physical and psychological needs (Daozeng, 1999). With the development

of the economy, people's need for a living environment is increasing, and they are beginning to explore greater spiritual requirements. For children, the environment's needs are reflected in safety, convenience, and social interaction requirements. Understanding environmental psychology will guide the design of children's activity centers (Chenghui, 2019). Understanding the use of environmental psychology in design can provide a better living environment for left-behind children in rural regions help considerably to tackle the problem of left-behind children.

Designing activity centers for rural left-behind children, environmental psychology may help researchers understand the emotions, perceptions, and behaviors of left-behind children towards the environment and thus create an environment that meets their needs. It can help researchers create a suitable activity center environment for rural left-behind children.

2.1.2 Psychology of Child Development

The psychology of child development is a fundamental branch of psychology and a core component of developmental psychology, often applied to children's education. It focuses on children's physiological, cognitive, social, and personality development at different stages. When designing activity centers, it is important to understand children's psychology and motivation for play, integrate theories on children's behavior, psychology, and children's activity spaces, and concentrate on the interplay between surroundings and children's growth to "prescribe the appropriate medicine" (Chenghui, 2019). In the design of the activity center, understanding the psychological development patterns of left-behind children is critical, as is investigating ways to encourage their healthy physical and mental growth through environmental adjustments.

Children have different developmental and cognitive abilities at different ages, so developmental stages and characteristics must be considered when designing activity centers. Theories and research results in child development psychology can guide the design of activity centers to meet children's needs better and promote their overall development.

2.1.3 Cognitive Development Theory

Cognitive development theory was proposed by Swiss psychologist Jean Piaget in 1970 and mainly studied the development of children's thinking abilities. The

theory suggests that children's thinking skills, including perception, attention, memory, thinking, and imagination, develop with age. Moreover, in this process, children accumulate experience and knowledge through continuous exploration and experience and then gradually understand the world and themselves (Yibo, 2014).

Children's development results from the interaction of individual genetic factors and external environmental factors; both the subject and object influence the development of children's psychology. The process of mental growth for children can be separated into four major stages: perceptual operation (0-2), preoperational (2-6), concrete operation (7-11), and formal operation (after 12), and the specific performance of each stage (Table 1).

Table 1 A summary of Piaget's cognitive development the theory

Age Range	**Overview of the Phases**	**Development Phenomena**
0–2 years	Deciding to act through perception.	Object survivorship. Fear of strangers.
2–6 years	Expresses external things through language and symbols, but its thinking is not yet logical and primarily self-centered.	The Language of Egoism Development.
7–11 years	Children at this stage analyze and process problems using their prior experience, and their thinking is active and reversible.	Keep the math working.
After 12 years of age	Freedom from reality allows for logical and creative reflections of hypothetical propositions.	Gradually develops mature reasoning ability.

Activity center design is closely related to cognitive development theory. Researchers need to comprehend children's cognitive characteristics different ages and

their interests and need to provide them with appropriate spaces and activity environments.

2.1.4 Maslow's Needs Hierarchy Theory

Maslow's Hierarchy of Requirements, created by American psychologist Abraham Maslow, begins with human needs and separates them into five stages, spanning bottom through top: physiological requirements, safety requirements, social requirements, respect requirements, and requirements for self-actualization.

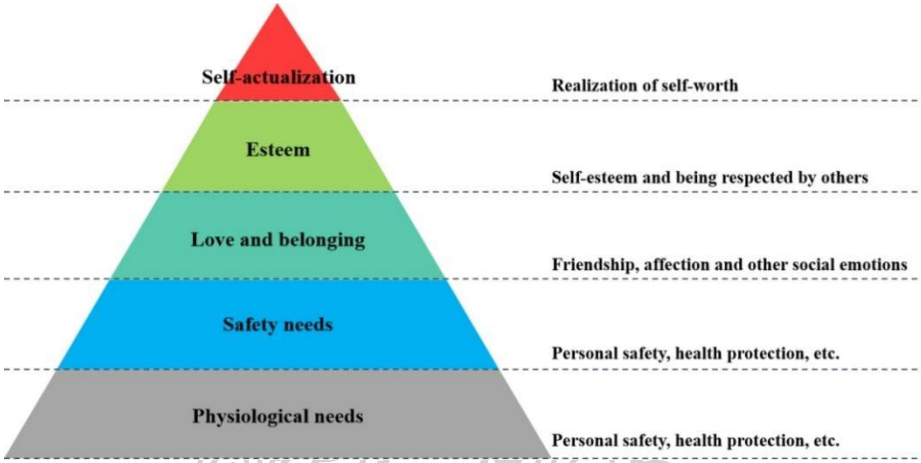


Figure 4 Hierarchy of needs theory

Source: Author adapted from Maslow, A. H., 1943

According to Maslow's hierarchy need theory, the needs of rural left-behind children, can also be answered in more detail. The first is the physiological needs, i.e., the basic life security for the survival of left-behind children, as the basic needs; the second level is the safety needs, i.e., physical and mental safety, to provide a safe environment for life, travel, and left-behind children's outdoor activities; the third level is social requirements, which include emotional and belonging needs, in the rural environment, places and facilities should be provided to meet parent-child activities as well as children's group activities for children to The fourth level is the need for respect, where children need to be given enough respect, including their self-esteem and sense of accomplishment, and encouraged to exercise their rights; the fifth level is the need for self-actualization, where an excellent outdoor space environment should provide opportunities for left-behind children to learn and demonstrate, and allow them to realize their self-worth so that they can be recognized in all aspects (Figure 4).

Because of the rapid economic growth of China and the implementation of precise poverty alleviation policies, as well as policies related to the care of countryside left-behind children in recent years, the problem of clothing and food has been solved for rural children who are left behind, and the first level of physiological needs has been met. With their basic physiological needs satisfied, rural left-behind children's requirements are more bent toward security and emotional needs. Because of their extended isolation from their parents, the guardians do not take care of them safely, and instructors and classmates do not care enough about rural orphan children to fill the role of their parents. Therefore, the safety and emotional needs are not satisfied and present more significant psychological problems, such as deviations in values and poor self-identity, they become significant causes of numerous issues in the group of left-behind children.

As a result, while developing activity centers for left-behind children in rural regions, Maslow's hierarchy of needs theory may be used to boost their mental and physical wellness, as well as their general development, by meeting their needs at various levels.

2.1.5 Regionality

Regionality is a design idea emphasizing that architectural design should consider local culture, history, and regional characteristics to achieve harmony and integration of architecture with the environment, culture, and society. Regionality design emphasizes the regionality of architecture, its harmony with the environment, and its sustainability and practicality. It is a way of thinking and emphasizing regional culture and Regionality in the context of globalization (Wenrui & Junping, 2009).

Regionality has many applications in architectural design, especially in preserving and transmitting traditional culture, urban renovation, and community construction. In recent years, Regionality has also been applied to design some public buildings and social welfare facilities. In designing these public facilities, regionalism considers the cultural, historical, and socio-economic characteristics of different regions. It integrates architecture into the local environment and society to improve architecture's adaptability and social value.

It is essential to consider regionalism when designing activity centers for children left behind in rural areas. Regional peculiarities profoundly influence the

mental health and conduct of children who are left behind, as well as the operation and efficacy of left-behind children's activity centers. Regional factors can be incorporated into all design aspects, including architectural style, material selection, color matching, space layout, and equipment configuration. It can help left-behind children establish a sense of identity with their hometown culture, provide them with a familiar environment, and reduce the stress of the adaptation period.

As a result, regionality is directly tied to the design of activity centers for children who are left behind in rural regions. Taking that regionality element into account can bring the activity center closer to local reality and more by the requirements of children who are left behind, resulting in better achievement of their development and growth.

2.2 Concepts and Theories Concerning Left-Behind Children in Rural Communities

2.2.1 Definition of the Term "Left-Behind Children"

"That so-called "left-behind" children are those who are raised entirely by grandparents while both parents are abroad." This phenomenon is common in China but rare in Western countries because Westerners believe that raising children is the responsibility of parents. Hence, they are more careful about This phenomenon is common in China but rare in Western countries because Westerners believe that raising children is the responsibility of parents. Hence, they are more cautious about having children than the Chinese (Zimu, 1994)." Parents with kids who remain behind are studying and working in other countries, making it harder to raise the next generation, so they leave them in the care of their grandparents or great-grandparents." It is a potential "human problem" that requires all sections of humanity to give priority to the education of disadvantaged children (Zhang, 1994).

The concept of left-behind children has dramatically changed (Figure 5). In 2003, 29 articles were published, and in 10 years, the total number of articles published was only 54. Since 2004, Chinese researchers have paid attention to this topic of "left-behind children," with the number of publications published continuously increasing:

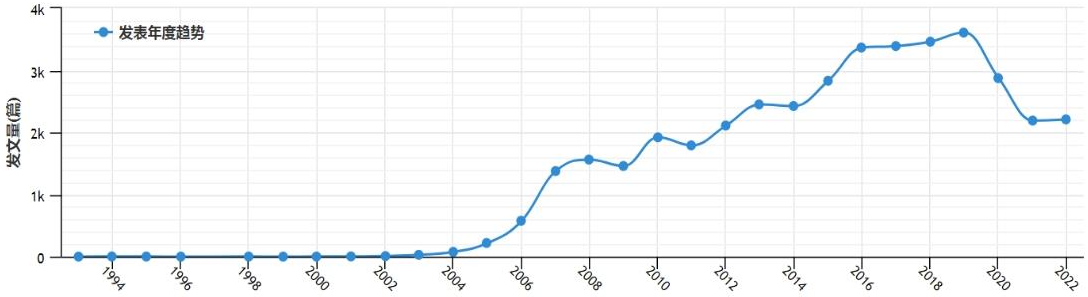


Figure 5 Number of articles written by children left behind

Source: China National Knowledge Infrastructure

Regarding the definition of children's age, it is appropriate to follow the age standard of the United Nations Convention on the Rights of the Child under 18 years old. Regarding the time spent outside the home, the 2000 census and subsequent surveys have adopted half a year as the reference length of time (Fulin & Chengrong, 2006).

Left-behind children must be cared for in their communities because one or more of their parents work outside the house and are often under the age of 16 (Ronghua, 2006).

The role of both parents in the family is crucial to the child's growth, so children left behind can be identified as long as "one parent is away" (Chuanjing, 2015).

Children who are left behind are those whose parents (both or only one) work outside for an extended period of time and are unable to stay with them for a variety of reasons, so they have to be raised in their fathers' homes (Xiaoou, 2017).

The State Council of China published the Opinions on Strengthening the Care and Protection of Children Left Behind in Rural Areas in February 2016 (Propaganda, 2016). The Ministry of Civil Affairs subsequently conducted a nationwide mapping exercise of children left behind in rural areas. The data published in that mapping exercise showed that the number of children left behind in rural areas nationwide was 9.02 million. Notably, the caliber of left-behind children used in the mapping survey is "children under the age of 16 whose parents are both working or one of them is working, and the other has no guardianship.

However, the most frequently cited data by experts and scholars and news reports before this are that there are 61.02 million rural left-behind children in China,

which was obtained by the All-China Women's Federation in 2013 based on the analysis of the data from the sixth national census, unlike the statistical caliber of left-behind children used by the Ministry of Civil Affairs in 2016, when the All-China Women's Federation used the term "at least one of the parents is away for work and under the age of 18". The All-China Women's Federation adopted the definition of "children under 18 with at least one parent working outside the home."

From the above representative definitions, the definition of "left-behind" children in academic circles is widely divergent. There are also differences in the age of those left behind, their duration, and how they were left behind. Among several essential elements concerning the concept of left-behind children, those that can form a consensus are the number of parents who are away, the length of time parents are away, and the definition of the age of children. Throughout the literature, few scholars have defined all three elements, and the definition criteria made by various scholars are not uniform. Regarding the age of stay, some researchers' criteria are controversial between the age of 16 and below and the age of 18 and below, and very few scholars consider the age of stay to be 17 and below.

Regarding the time parents are away, most researchers believe six months is the most appropriate, while others suggest more than three months, four months, and more than seven months. Most academics believe that children who have both parents away for work are left behind. However, some scholars suggest that children with both parents away are "left-behind" children.

Although no specific official definition of children who have been left behind is provided, several elements of the meaning of the concept of rural left-behind children can be seen to be consistent, namely, whether the child's parents have gone out to work, whether others raise them, the length of time they have been away, and the child's age.

Here, I define "rural left-behind children" as children under the age of 16 who are left at home because their parents or guardians are working, doing business, or farming outside the house for a long time, or only one of them is at home to take care of the children, resulting in the children being separated from their parents or guardians for a long time.

The researcher defines "rural left-behind children" as kids under the threshold of 16 who remain at home because their guardians or parents are working, doing business, or farming outside the house for an extended period, or only a single of themselves stays home to care for the kids, resulting in the kids being cut off with their parents or guardians for an extended period.

2.2.2 Education Related Research

The topic of education for children left behind in rural communities has attracted extensive attention, and many scholars and experts have conducted relevant studies. The following are some representative studies.

The relationship between parents and their kids is essential in determining the type of education children get and how well they grow later in life (Xianzuo & Qingyang, 2015). A thorough examination of the status of children other kids leave behind in two ways, family education, and school education, identifies these as major problems and suggests relevant problem implementation (Chengrong et al., 2014). From the perspective of home-school-political collaboration, it demonstrates that educating children left behind in rural regions necessitates the collaboration of family, school, government, and society (Binrong, 2022). Parents must appreciate the value of family education. The government should build a long-term system to address rural left-behind children's academic and social assistance needs.

To effectively solve the education and care problems of left-behind children from rural areas, the government should fundamentally reduce the number of left-behind children, update rural parents' education philosophy and methods to alleviate parent-child education problems, and focus on citizens' moral quality and promote the construction of rural customs and folkways (Ling & Wenping, 2022). To analyze the present state regarding schooling for left-behind children and its root causes, to conduct a study on the current situation of education for left-behind children, to investigate the causes of their current situation and the methodology for addressing this problem, and to primarily provide some assistance in resolving the issue of children who are left behind (Zhong, 2022). The existing education scenario for left-behind children in rural regions is investigated and analyzed to improve the educational efficiency of these students (Hudong, 2021). More education and care are required in the improvement and innovation of education and care systems for left-behind children in rural revitalization

due to the effect of their developing environment. It is vital to gather the strength of family, school, and society in order to build a flawless education and care system (Xianhua, 2020).

The preceding study demonstrates that the government, schools, society, and families must all work together to solve the issue of left-behind children in rural regions. At the same time, educational services and support also need to be flexible regarding strategies and measures, considering the actual situation and needs of left-behind children.

2.2.3 Research Related to Group Characteristics

2.2.3.1 Physiological Characteristics

Left-behind children often lack adequate nutrition and exercise due to living alone for long periods or without parental care. They are in poorer physical health than children raised at home (Fellmeth et al., 2018). Furthermore, owing to a lack of parental care, left children are prone to infections and require prompt medical attention (Ni et al., 2004). This phenomenon is more evident in boys than in girls (Chang et al., 2017). The disparity between rural left-behind males and other kids is substantially greater than the disparity between rural left-behind girls. It was shown that children who were left behind had lower levels of physical development and nutrition than non-left-behind kids, particularly during the key time of physical development, but this has not yet impaired their physical health condition.

2.2.3.2 Psychological Characteristics

Children who are left behind confront several psychological issues. Left-behind children frequently experience loneliness, dread, helplessness, and low self-esteem due to a long-term absence of loving care and protection. Additionally, left-behind children's self-identity and interpersonal skills are also affected by the prolonged absence of their parents. They may exhibit psychological problems such as anorexia, rebellion, and depression.

Enhancing the treatment services provided for local left-behind children and women is crucial for strengthening rural grassroots construction (Yufen et al., 2022). The relatively low occupancy of educational and physical and mental resources among rural kids who are left behind, the growing prominence of physical and mental health problems, the crippling physical and mental health service system,

and the difficulty of running on the ground and achieving the effectiveness of help have all become serious issues that must be addressed (Bing et al., 2023). Left-behind children need practical communication items for learning challenges due to a lack of parental accompanying and direction, psychological problems, and growth problems they encounter while growing up, and thus, various psychological barriers emerge. If effective solutions to the psychological development problems of rural left-behind children and proper psychological counseling are not taken, a series of social problems will quickly arise (Ming, 2022). Future research should strengthen the comprehensive application of standardized measurement tools, vigorously conduct longitudinal follow-up studies, and conduct research with mental health as the independent variable to improve the demand for mental health services (Yigui & Shengmei, 2022). Adding mental health education to classroom management in rural elementary schools can not only effectively cultivate students to establish a correct worldview, outlook on life, and values but also allow left-behind children to feel the warmth and grow up physically and mentally under the guidance of scientific psychoeducation (Chengying, 2022).

(1) Special Psychological Characteristics

Children left behind are prone to aberrations in psychological and educational elements owing to a lack of warmth and care from their parents and relatives (Wenxuan, 2016). Various factors contribute to the development of psychological features in children who are left behind, and the emergence of this issue is an unavoidable byproduct of social and economic progress (Jin, 2018). The primary causes are a lack of compassion and care, a lack of family education, and a lack of formal education. In order to solve the psychological issues that occur, three areas should be addressed: the social education function, school education, and the psychological quality of left-behind children, and matching measures should be vigorously pursued (Bingwu, 2018). Rural laggards Children exhibit cognitive bias, negative emotions, behavioral disorders, personality disorders, interpersonal connection disorders, and adaption disorders (Binrong, 2012).

First, lack of communication, introversion, and rebelliousness.

Because many rural left-behind children have lived with their grandparents since they were youngsters, they communicate with their families less frequently than non-left-behind children. This also exacerbates left-behind children's

inferiority mentality, making them more cautious when dealing with others and more prone to solid rebellion.

Second, they are bored with school and have poor self-control.

Due to the severe spread of subculture in rural areas and the influence of parents with low education levels who go out to work to earn money, many rural left-behind children think that learning is not essential to them and have poor self-control, and are resistant to learning. With poor supervision by their guardians, their attention is easily distracted.

Compared to those who are not left behind, the psychological features of children who are left behind are defined by the following negative emotions (Figure 6).

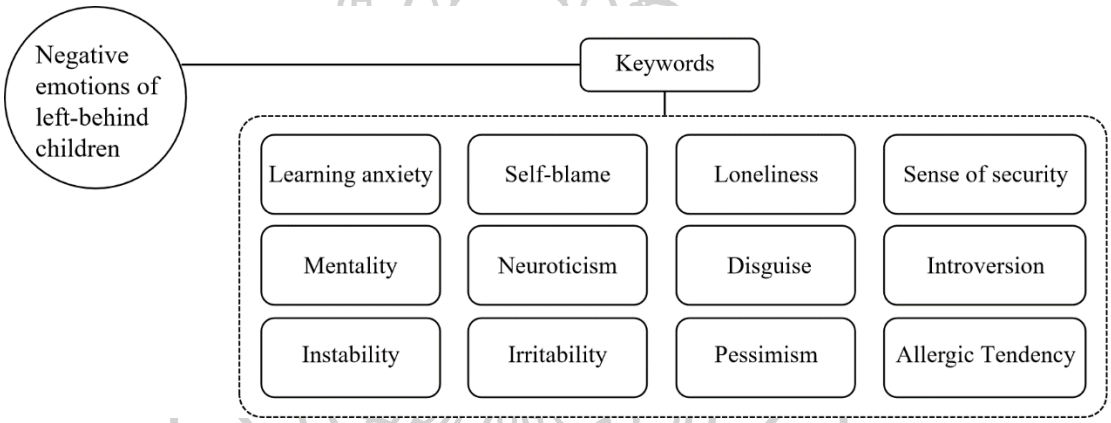


Figure 6 Negative emotions of left-behind children map

Source: Self-drawn by the author, 2022

(2) Psychological Scale Characteristics

Children differ from adults due to their physical and psychological developmental variability. The psychological scale of left-behind children investigates the link between their psychological cognition and surroundings. Using the left-behind children's psychological scale as the standard in the design of outdoor activity spaces for rural children is more conducive to the humanization of outdoor activity spaces and the creation of outdoor activity spaces that are more suitable for the development of left-behind children. A venue that respects children's psychological scales may help left-behind children feel comfortable and develop activity spaces that are more psychologically acceptable to left-behind children.

Because children have different psychological scales for spatial safety distances, they prefer more enclosed, centripetal enclosed spaces, such as under tables and inside caves, than large-scale architectural spaces (Zihui, 2019). The book "The Language of Architectural Patterns" mentions that "wherever children play, they should build caves that fit their physical and mental scale, and these caves can be located in remaining natural spaces, such as under stairs and worktables." This mentality is an innate self-protective function of children. Younger children are more likely to feel psychologically secure in relatively small and compact spaces due to their lack of perception of the distance scale. They feel more relaxed and happy in spaces similar to their body size (Boyang, 1990).

In general, left-behind children have extraordinary growth experiences, so what they feel and see in the world differs from the adult perspective. The concept of the scale of children who are left behind should be introduced in the design of outdoor activity spaces for rural left-behind children, and the space design elements should be fully considered from the perspective of rural left-behind children to create an outdoor activity space environment for rural left-behind children that meets their physical and mental characteristics.

(3) Behavioral Characteristics

Children with divorced parents, left-behind children, and children who relocate to work alongside their parents account for a considerable share of children from noteworthy families. Their behavioral habits have both commonalities and differences; grasping their behavioral characteristics and giving full play to the supporting and guiding roles of schools and teachers will allow children from notable families to grow up positively and healthily (Xiangguo, 2016). Left-behind children have a strong sense of inadequacy in terms of self-awareness, and a pronounced tendency of egocentrism on the other. Regarding emotional problems, left-behind children are emotionally unstable and prone to somatization, terror, hostility, paranoia, obsession, and interpersonal sensitivity. State anxiety and depression are much greater in left-behind children than in non-left-behind children, and there are age and gender disparities (Jianguo, 2016).

Studies have shown that rural middle school left-behind children with high life satisfaction have more pro-social behaviors and fewer emotional and

behavioral problems (Xinliu et al., 2012). Children left behind are less mentally stable and have more psychological difficulties than non-stay-behind youngsters (Lu, 2014).

Although rural left-behind children are a relatively particular group, they share certain similarities with non-left-behind children regarding their behavioral characteristics at different ages. The behavioral characteristics of children at different ages are mainly reflected in social and emotional aspects (Table 2).

Table 2 Behavioral characteristics of children at different ages

Age levels	**Social and Emotional**	**Behavioral Characteristics**
3-6 years	At the early stage of development, children understand gender, like to play with same-sex partners, want to be valued and recognized among peers, and their values are initially formed.	Has a good sense of balance and enjoys engaging in play activities. Needs to be accompanied by a parent.
7-11 years	It is a transition period in the child's personality when he or she begins to have privacy and secrets of his or her own and seeks intimate personal space. Gradually, they tend to be well-behaved, quiet, and very interested in the outside world and group activities.	Dare to move independently but still need not be able to protect themselves. Behavior is beginning to be gender-specific.
12-14 years	Changes in perceptions and the onset of puberty. Emotional and social development becomes independent.	At the peak of school age, activity time becomes less, and gender differences are more pronounced.

Left-behind children exhibit various behavioral features at various times. Generally speaking, the points children are interested in and the way and content of their activities are very different for different age groups. As a result, we should create a better outdoor activity environment for left-behind children by paying attention to their developmental phases and respecting their conduct.

The features of children's behavioral activities fluctuate depending on their gender (Table 3). Boys are more curious about novel environments and enjoy adventurous activities. Conversely, girls prefer small, non-strenuous, and quiet activities such as playing house and jumping rope.

Table 3 Characteristics of behavioral activities by gender

Contrast	**Boys**	**Girls**
Type of Activity	Creative, challenging, hilarious and physically demanding games	Quiet, imitative play
Range of Activities	Relatively large range	Smaller range
Activity areas	Sports Zone, Discovery Adventure Zone	Role play, jump rope and shuttlecock areas
Activities	Generally disorderly, preference for physical contact	Generally, more orderly and less competitive
Social Behavior	Highly sociable, enjoys group games	A small circle of people who prefer to interact with a few people
Game facilities	Climbing, exploratory facilities	Facilities such as cabins

2.2.4 Research Related to Socialization Issues

Social difficulties are mostly concerned with adjusting left-behind children to their surroundings and learning appropriate social conduct.

The problem of left-behind children in rural regions is critical and cannot be overlooked in China's social development process. The issue is about the socialization of abandoned children in rural regions. Socialization issues should be addressed from three perspectives: family, school, and society (Hong, 2013). The lack of long-term parental care, schooling, and competent direction contributes to the

socialization problem of children left behind in rural locations. This affects their capacity to grow up healthy and integrate efficiently into social life in the future, as well as the stability and peace of society and the State (Wenjing, 2018). The polling found that rural left-behind children are poorly socialized, lack long-term life planning, have unclear life goals, and are prone to feeling lost and confused about life (Ning, 2015).

To encourage the healthy development of left-behind children, we aim to construct a social support system for them and fully use the responsibilities of family, school, government, and society (Meishu, 2009). intervening in this study from the social work perspective so parents, government, schools, and the community can work together to create good socialization conditions for left-behind children (Jianhong, 2009).

The road of public governance for the socialization of left-behind children in rural regions is by improving the government's public role to offer equitable education for children left behind and by strengthening the family's capacity. Cultivation of feeling and affection for left-behind children, enhancing school management and instruction, and building non-profit organizations' Public welfare awareness for children who have been left behind (Yufei et al., 2018).

2.3 Design Concepts and Theories for Children's Activity Centers

2.3.1 Definition of Activity Centers for Children Left Behind in Rural Communities

A rural left-behind children's activity center is a public service organization developed to address the numerous issues left-behind children confront, mainly by providing various children's activities, education, and psychological support. It is a place jointly invested in and managed by the government, society, and various organizations. Its goal is to create a helpful, safe, and warm environment for rural left-behind children in order to encourage healthy growth and development. At the same time, the activity center also provides a social platform for left-behind children, allowing them to communicate, learn, and play with their peers and alleviating their psychological burden caused by long-term loneliness. Creating and building activity

centers for left-behind children in rural regions need widespread participation and support from the government and the community.

2.3.2 Current Situation of Children's Activity Centers in China and Abroad

2.3.2.1 Status of Activity Centers for Left-Behind Children in China

Since their discovery, left-behind children in China have drawn attention from all areas of life. The number of left-behind children in China's rural areas has greatly dropped with the progress of China's new rural construction and the basic fulfillment of poverty eradication. However, certain localities continue to have a high population of left-behind children. Their main problems have changed from basic living needs to emotional, psychological, social, educational, safety, and other socialization issues. An excellent spatial environment can alleviate these problems for left-behind children and help them grow up in a healthy environment (Ziwen, 2022). Since China's regional economy is in a state of unbalanced development, the issue of being left behind has attracted academic attention. Simultaneously, the design of children-related recreational area surroundings has attracted considerable attention recently (Pinze, 2020).

Taking care of left-behind children as the starting point, we applied design research to the activity center for left-behind children (Jian & Wei, 2022). That is, to address the emotional demands of the user's children who remain behind the requirements of the activity center's guardians (Ling & Wenping, 2022). Based on the psychological needs and social environment, design suggestions for Chinese children's service stations were given regarding space, color, light, and feasibility (Jingyi, 2021).

One of the basic approaches to alleviate the spatial environment concerns of left-behind children is to establish activity centers for them in rural regions. The design of activity centers for left-behind children in rural areas is one of the fundamental ways to solve the problem of the spatial environment for left-behind children, which can compensate for the physical and mental problems of left-behind children to a certain extent, according to the needs of left-behind children, including spatial needs, physiological safety needs, psychological safety needs, behavioral safety needs. Combined with the local environment, it meets the needs of left-behind children and carries out the design practice of left-behind children's activity centers (Lixing, 2022). By providing a good activity center for left-behind children, we can effectively

compensate for the lack of emotions in the children's hearts caused by their parents' long absence and thus effectively help them overcome more difficulties in their lives and studies and promote healthy and happy growth (Leilei, 2019). Creating a good activity center can, to a certain extent, compensate for the lack of inner emotions brought to children due to their parents being away for a long time, effectively help them in their studies and lives, and assist them in their psychological guidance, making them healthy and happy children (Yingdan & Yi, 2017).

Many places in China have built activity centers for left-behind children, which vary in form and scale but generally provide services such as extracurricular activities, psychological counseling, health checkups, and cultural and artistic activities for left-behind children. However, due to limited funds and personnel, some activity centers for left-behind children must match their facilities, service quality, or content needs. Simultaneously, because rural children left behind in certain places are more dispersed, creating and administering activity centers for children who have been left behind is challenging. Therefore, the building and administration of activity centers for left-behind children must be strengthened and enhanced on an ongoing basis.

2.3.2.2 Status of activity centers for left-behind children Abroad

The issue of left-behind children exists in China and is a global one. Therefore, specific research and practices in foreign countries are connected to centers of activity for children left behind. However, foreign countries understand left-behind children differently, so only a few scholars have studied and explored this issue.

U.S.: Left-behind children in the U.S. mainly refer to orphans caused by their parents' poor economic situation, single-parent families, and domestic violence. In the United States, activity centers for left-behind children focus on children's academic and mental health and social and athletic activities. Charities, churches, or community organizations usually operate these centers.

Europe: Children left behind in European countries are mainly refugee children, migrant children, and orphans. Activity centers for left-behind children mainly support language learning, cultural exchange, recreation, and sports. These centers are usually managed and operated by governmental or non-governmental organizations.

Japan: Left-behind children in Japan are mainly due to parents' busy work schedules and inability to care for their children. Activity centers for left-behind children in Japan provide home-based care and child development activities, including sports, music, and painting. Social welfare agencies, churches, or community organizations usually operate these centers.

The study mainly covers the following aspects: first, the influence of activity is focused on the physical and mental development of children falling behind. Activity centers can help left-behind children enhance their social skills, learning motivation, and mental health, ease their loneliness and worry, and boost their self-esteem and self-confidence; secondly, the service mode and management of activity centers. Activity centers need to have a suitable management model and supervision mechanism, and also need to focus on team building and staff training; again, activity centers need to integrate with the community. Activity centers can become an important part of community development and need to work closely with other community institutions and organizations to provide better services and support for left-behind children; and finally, the sustainable development of activity centers. Activity centers need to have a stable source of funding and mode of operation, and at the same time, they need to focus on cooperation and interaction with all aspects of society to improve the social influence and sustainability of activity centers. In conclusion, few foreign studies exist on activity centers for left-behind children in remote regions. Still, scholars are committed to investigating the impact of the centers on the physical and mental development of the children, the service model and management, community integration, and sustainable development, and to putting forward corresponding solutions and development proposals. These study findings contribute to the enrichment and improvement of theory and practice in activity centers for left-behind children and the development of children who are left behind.

2.3.3 The Impact of Activity Centers on the Development of Left-Behind Children

Children's physiology and psychology continually change as they grow, and different spatial contexts have distinct effects on children left behind. The spatial environment has a profound impact on left-behind children. A pleasant and appropriate environment promotes the proper growth of children's bodies and brains. It can also

positively impact children who enter the site to play. The researchers focused on analyzing the impact of the rural activity space environment on the physical, psychological, cognitive, emotional, and safety aspects of children left behind.

2.3.3.1 Physiological and Psychological Influences

Childhood is the period of the most rapid intellectual and psychological development, the critical stage of character formation, the key stage of self-realization, and the best time to cultivate interests and discover potential. As children grow in height and weight, their perceptive abilities in all aspects of their bodies are enhanced. Therefore, when designing outdoor activity spaces for left-behind children, their physiological and psychological characteristics and needs for space scales should be fully considered, and different space scales should be designed.

Most left-behind children are vulnerable to certain psychological disorders due to an absence of family care or no one to listen to their views, the most common being introversion, isolation, and lack of self-confidence. Some want to get their parents' attention by rebelling and getting into trouble, and long for their parents to come home to see them more often. However, these problems will hurt their mental development over time. Many rural left-behind children do not realize the importance of learning to them, drop out of school early to work, and lack proper planning for the future, which will impact their lives.

A positive activity setting for rural left-behind children supports physical and mental development. Opening up activity areas to remote children who are left behind to play allows them to gain knowledge of society and develop new skills via play. A rich and exciting activity space can attract rural left-behind children to actively participate, effectively improve their inner loneliness and develop their creativity, encourage them to make friends, enhance their self-confidence, and improve their overall quality and their mental health development.

2.3.3.2 Influence of Cognitive Development

Children are in the process of interacting with the environment from birth. The environment stimulates the brain through various human senses, such as vision, hearing, smell, touch, and taste. It guides their behavioral activities to understand various environmental elements, such as size, shape, color, texture, and temperature and gradually forms their cognition of the world. Simultaneously,

children's active behavior impacts the establishment of spatial environment components. With this interaction, children's cognitive ability in a spatial environment is promoted, and it can facilitate the development of children's language expression, observation, thinking, imagination, and memory. Children's cognitive development requires constant interaction with the spatial environment in their daily lives to develop into more complex perceptual activities gradually. Since the rural environment is relatively homogeneous, rural left-behind children have fewer ways to cognize the world than urban children of the same age. An excellent spatial environment for outdoor activities provides rich and comprehensive sensory stimulation for left-behind children, which is conducive to improving their cognitive abilities of the world and the environment, thus promoting their sensory development.

2.3.3.3 Influence of Emotional Development

Rural outdoor playing space for children is favorable to encouraging interactive dialogue between rural left-behind children and their guardians. In outdoor activities, parents and children work together to aid one another, and parents provide timely encouragement and instruction to their children. Left-behind children will become solid and relaxed because of this feeling of affection and care, and at the same time, they can gain more happiness in the game. At the spiritual level, although guardians cannot replace parents, children can have positive interactions with their families, increasing trust among left-behind children and their parents is essential for creating healthy family ties.

The left-behind experience of children who are left behind has an emotional influence not only on the left-behind period at that time but also on their feelings in adulthood, particularly in interpersonal interactions. Adults who have been left behind are more prone to exhibit social anxiety than those who have not been left behind. Rural left-behind children's social contacts are primarily expressed in their relationships with classmates, instructors, and guardians. Outdoor activity spaces for children can bring groups of left-behind children together to help each other and grow together. By getting along, they can learn to understand other people's different emotions, opinions, attitudes, and ways of dealing with them and improve their social skills. In such an environment, they can locate like-minded playmates, thereby boosting the low self-esteem of rural left-behind children who have lost care for an extended

period. They can also learn much of the knowledge they cannot learn in school from the public welfare workers in the community.

2.3.3.4 Safety Impacts

Safe development includes both manufactured safety and accidental safety. From the perspective of the natural environment, rural areas are not as densely built as cities, the land is vast and sparsely populated, and most natural environments (such as mountains, rivers, and lakes.) are beautiful to left-behind children who are fully aware of self-protection, but they lurk many dangers. In addition, due to the lack of safety measures in many rural areas, most natural environments with safety hazards do not have prevention and emergency rescue facilities, which is also why left-behind children are prone to accidents when playing outside.

From the perspective of the children left behind, they must be mature enough, when playing, they will focus on the immediate or a small area but ignore pedestrians, vehicles, and the surrounding environment, and therefore more vulnerable to accidental injury. Therefore, in the design of the activity space, we must consider comprehensively to prevent the space created by human factors from bringing physical injuries to children's activities. Secondly, in the prevention of manufactured crime, we need to prevent the existence of criminal space, confined space, in the design of the entire space as far as possible from making the view relatively open. The activity center can provide a safe environment for friendships so that left-behind children can make new friends, establish healthier social relationships, and reduce the risk of being negatively affected by the outside world.

2.3.4 Influence of Design on the Development of Left-Behind Children

2.3.4.1 Impact of Self-identity

The goal of designing activity centers for left-behind children in remote regions was to help them grow, develop, and integrate into society better and to enhance their self-identity. Constructing an activity center that can satisfy the demands and characteristics of left-behind children is critical as it may serve as a living and learning environment for these children, help them build up their self-confidence, self-esteem, and self-reliance, and enhance their social skills and sense of community.

Activity centers have a good influence on the self-identity of left-behind youngsters. Activity centers' interaction and adaptability are also crucial in

developing left-behind children's self-identity. They can better recognize themselves, comprehend others, and create self-values and a feeling of social duty by communicating and cooperating with other left-behind children.

As a result, while constructing a regional activity center for left-behind children in rural regions, consideration should be given to the particular requirements and characteristics of the left-behind children to establish an inclusive activity center that is interactive and innovative, allowing the left-behind children to gain satisfaction and growth while also enhancing their sense of self-identity and social adaptability

2.3.4.2 Impact on Mental Health

A vital study area is the influence of activity center design on the mental health of at-risk kids. Rural abandoned children are more vulnerable to mental health problems due to a lack of family companionship and care.

Rural children who remain behind suffer emotional disorders, behavioral issues, and mental health problems, but the mental health of left-behind children who participate in activity centers has improved (Qiong & Zhengkai, 2018). The requirements and psychological status of left-behind children should be properly considered in the design of the activity center, give them care, support, and motivation, and improve their self-esteem and self-confidence (Lu & Chung, 2014). Activity centers can provide a secure, stable, and intimate atmosphere to assist children left behind in developing a social network and a social support system, both beneficial to the psychological health of left-behind children (Yanping & Ling, 2007). Activities such as music, art, and handicrafts can assist left-behind youngsters in venting their emotions, reducing stress, and boosting their mental health (Ting, 2009).

In summary, the design of activity centers has an essential impact on left-behind children's mental health. Activity centers should focus on left-behind children, fully understand their needs and psychological state, provide a safe, stable, and intimate environment and beneficial activities, and help left-behind children establish a social network and a social support system to promote the development of their mental health.

2.3.4.3 Impact of Social Communication Ability

Left-behind children frequently suffer from a lack of social interaction ability and a long-term loss of parental companionship and social milieu. Therefore, the design of activity centers should focus on improving left-behind children's mental health and cultivating their social interaction skills.

In the design of activity centers, consideration can be given to introducing team activities, role-playing, and other highly interactive activities so that left-behind children can learn cooperation, communication, and expression in these activities and enhance their social skills. At the same time, training in social skills, etiquette and sociability may be incorporated into the design to assist left-behind children in developing the correct social conceptions and rules of behavior and improving their social skills and interaction impacts.

The design of activity centers favorably influences the interpersonal skills of children alone. For example, the activity center can provide various team activities and social skills training, which can increase the left-behind children's interpersonal ability and self-confidence, resulting in more positive conduct and a greater sense of self-identity. As a result, the design of activity centers should focus on left-behind children's social interaction capacity and increase their social skills and self-confidence via suitable activities and training.

2.3.5 Case Studies Related to Activity Centers

There have been few studies on the design of welfare institutions for left-behind children at home and abroad. The researcher tries to learn from the design studies of other children's welfare facilities, combine the cases to analyze the future situation of the subject development, summarize their design methods, and then perform adaptive design studies for left-behind children's psychological, physiological, and behavioral requirements.

2.3.5.1 Chinese Welfare Facility Design Practices

(1) "Xamutang Bamboo Lotus House" Rural School

The "Xamutang Bamboo Lotus House" in Xamutang Village, Wanan County, Jiangxi Province, was built to solve the needs of rural children left behind for activities and reading books with low technology and low cost. The construction site is an important way for villagers to get to the mountains, so it needs to be circulated. Inspired by the bamboo behind the mountain, the installation of an "artificial bamboo forest" can guarantee circulation and keep in line with the original texture of the village (Figure 7).

a. Top view b. Event Space Scene c. Inside the event space

Figure 7 Xamutang Zhulian House

Source: archcollege Website, available from *http://www.archcollege.com/archcollege/2018/11/42410.html*

Local materials: The roof made of local bamboo plus sunlight panels is environmentally friendly, cost-saving, and easy to construct. The gaps in the façade due to the size of the sunlight panels were filled by the designer with bamboo strips, just enough to form a design detail that helps air circulation and facilitates parents' observation of their children.

Combination of old and new: The exterior materials were chosen from local characteristic elements: old brick walls and brick floors. The side near the old brick wall of the original ancestral hall was made of transparent tempered glass, while the other was made of translucent sunlight panels, which could focus the eyes on the surrounding scenery. The interior material is made from a European pine board, synthesized from waste wood chips, and generally used for outer packaging. Which not only has a sense of texture that matches the environment very well but is also very cheap and environmentally friendly, and easy to cut.

This case's design background aligns with this research, and the primary users are left-behind children in rural regions. This example is an isolated institution for at-risk children, and the space design fits the users' demands for socialization, games, sports, and relaxation, which is suitable for children's development and is worthy of investigation in this article.

(2) Environmental Education Theme Children's Park in Guizhou Province, China

This case is located in Zhongguan Village, Tongzi County, Guizhou Province, which is remote and economically backward in the northern mountainous region of Guizhou. Like most villages, the children in this village are primarily left-behind children living with their grandparents. In terms of materials and construction, this instance fits the demands of rural children's activities in terms of space and focuses on low-cost and low-tech construction (Figure 8).

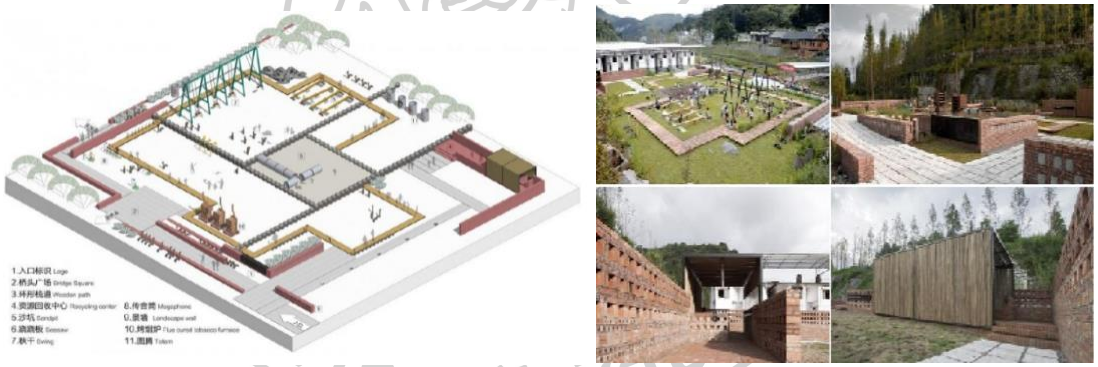


Figure 8 Environmental Education Theme Children's Park in Guizhou Province

Source: Landscape China Website, available from *http://www.landscape.cn/landscape/7464.html*

The concept of environmental protection and ecology Most of the materials used are the waste materials generated by the village in the construction process and some old things dismantled, which not only reduces the cost but also effectively uses the waste materials, minimizes the pollution of the rural environment, and achieves the effect of ecological and environmental protection.

Focus on user participation: The villagers and children in the village are involved in the construction. They give temperature to the site as its users collide with the site, i.e., the relationship between people and the site is created.

Subtle educational significance: Building a children's playground with old materials and scraps follows the principle of economy. This idea of recycling coincides with the traditional virtues of thrift and frugality in life, and presenting these in the program also subtly influences the children.

This case has good learning significance for this study: Firstly, the project background is similar, and most items are left-behind children from rural regions. Second, the beginning point for this case design is the same as the starting point for this study; both of them wish to do something for children in the countryside, particularly those who have been left behind, so that they may have enjoyable places, warm protection, and grow up healthily and peacefully like the children in the city; thirdly, this case has the same design starting point as this study. Third, this case is a successful case of rural renovation and construction, which protects the rural ecological environment, shows the rural culture, and has excellent educational significance for rural children.

(3) Landscape Installation Design of Forest Pan Dream Network in Pengzhou City, Sichuan Province

" Yingchun Village is in Junle Town, Pengzhou City, Sichuan Province. The surrounding environment influences the case and is around 500 square meters, including "forest pan, courtyard, road network, and children." Located on the grassy area across the river from the Sanhe compound, the "Forest Pan Dream Net" is an interesting "net" that closely links the woods, the crumbling wall, the ditch, the courtyard, and the public toilet. The significance of the net dream installation is to bring people out of their homes and back together again, replacing the "Internet" on cell phones with a "net" in nature and enhancing the social links between children and villagers (Figure 9).

Figure 9 Forest Pan Dream Network Landscape Installation Design

Source: Landscape China Website, available from

http://www.landscape.cn/landscape/action/ShowInfo.php?classid=6&id=10791

① Cases are sustainable. The case was designed with environmental and usage sustainability in mind, ensuring that the unique woodland form of western Sichuan would not be destroyed as much as possible, making the game device form a good relationship with the trees and rural environment in the current situation of the site, and using the original trees as structural support to make the device and the woodland integrated (Figure 2-11). ② Openness and diversity. The activity site is an open biological activity space; the primary body of the exercise equipment comprises mountainous climbing nets with varying slopes. In order to simulate the complex challenges that must be experienced during the climbing process, many "obstacles" have been placed on the climbing nets and on varying slopes to give a range of possibilities to fulfill the play and sports demands of diverse groups of children. And sports need of various groups of children. Four kinds of auxiliary play are added: trampoline, shuttle ground, tunnel between nets, and hammock. The goal is to encourage the development of children's skills in various areas (including reflexes, motor balance, and auxiliary muscles) through activities such as climbing, jumping, and grasping. ③ User participation Villagers and children are involved in the construction during the project landing process. Such a participation process will make them more involved and identify with the project, which is also fun.

The design background of this case is also rural, and most of the users are rural left-behind children. The biggest highlight is that the small space is attractive enough for children and can promote healthy development.

Summary of China's welfare facilities design practice: "Our Square" is a complex place that can meet the use of all ages, and the background location of the case is the same as the object of this paper, and the design approach of the case has reference significance for this paper. "Yiwei Park" is a case that has the same nature, objectives, and population oriented as the object of this paper. The case because of the nature, objectives, facing the crowd and the research object of this paper is consistent, so its design strategy, design concepts for the research object of this paper has a great inspiration and reference role. "Lin Pan Dream Network" is a child fully integrated into the natural environment of the interesting "net ", the design of the case is full of creativity, and the case itself is located in the rural environment for rural children, and the research object of this paper is consistent with the direct inspiration for this paper.

2.3.5.2 Design Practices of Child Welfare Facilities Abroad

(1) Exploring the Design of Children's Welfare Facilities in Japan

In his decades of research and design of children's facilities, Mitsuru Senda, the president of the Architectural Institute of Japan, developed a unique design concept for children's facilities in his country and Japan. He believes that the role of environmental space is highly valued in nurturing and educating children. He proposes that an excellent spatial environment can guide children to be friendly with their partners and, at the same time, cultivate their social nature. The environment is critical to the lives of children. Children's behavioral abilities and behaviors are influenced by their surroundings, and they can gain perceptual information through physical perception and practical experience.

Nonaka Nursery integrates with the native environment： In Japanese child welfare facilities, the integration and interaction of children with their native environment are emphasized. Mr. Mitsuru Sendai's Nonaka Nursery in Shizuoka Prefecture is based on the concept of "soil conservation," which is a concept of free conservation based on the power of nature, and the entire building is located as close to the earth as possible. Moreover, considering the need for variety in the children's space,

the side facing the garden was low, and the other was high with a single slope roof (Figure 10).

Figure 10 Nonaka Conservation Park

Source: A Case Study of Japanese Kindergarten Design, a book published by Huazhong University of Science and Technology Press in 2021

"Ring around a tree," which integrates the indoor environment with the outdoor environment. In addition to integrating the building form with the native environment, Japanese children's facilities emphasize the communication between the interior and exterior of the building and the surrounding environment. The "Ring Around a Tree" kindergarten designed by the Japanese architectural firm taluka architects is a perfect example of this concept. The main building of the kindergarten is surrounded by the branches and leaves of a large tree, breaking down the walls between both the interior and the exterior of the structure and connecting it with the natural surroundings. The staggered floor plates surround the tree at the center, while the columns and stairs are hidden in the foliage and branches, maintaining the integrity of the building. In order to protect children, the architects did not design too many obstacles and railings, which can mitigate some injuries to children from accidental knocks (Figure 11).

Figure 11 "Ring around a tree" kindergarten

Source: domusweb, available from

https://www.domusweb.it/en/architecture/2011/07/07/ring-around-a-tree.html

Focus on the construction of the interior space environment: In the design of interior spaces, Japanese designers also focused more on creating places more suitable for children's lives, forming a unique scale and style based on children's physical and psychological characteristics. tomonoki-Himawari kindergarten, in order to adapt to children's developmental changes, the architect set up different spaces, such as classrooms with different ceiling heights, playrooms hanging above the courtyard, and circular outdoor corridors of varying widths, allowing children a variety of spaces to play. To further stimulate and enrich children's sensitivities, the entire facility is planted in three dimensions in a way that showcases the changing seasons and vegetation, creating a courtyard that brings the outdoors in. Inspired by these environments, natural themes such as insects and trees are hidden as patterns and objects in and around the building, allowing children to enjoy the space as they continue to discover new things (Figure 12).

Figure 12 Tomonoki-Himawari Kindergarten
Source: onewedesignweb, available from
https://www.onewedesign.com/ertongkongjiansheji/76-1877.html

(2) Design practices for child welfare facilities in the United States

Bruce Komiske is a world-class leader in design for healthcare.The Lurie Children's Hospital in Chicago, which he intended, developed, and built, exemplifies his work in this area. The Ann & Robert H. Lurie Children's Hospital in Chicago is an excellent example of this type of work (Figure 13). During the design process for this children's hospital, Bruce Komiske and his team formed a child advisory committee and a family advisory committee to listen carefully to their needs and to seek their feedback on the proposed design. The hospital eventually boasts unique design points, such as a children's hair salon and two outdoor healing gardens, thanks to the suggestions of the children's patients. The construction also employed a series of new technologies in research, introducing natural light and creating meditation spaces to shorten the time it takes for patients to heal physically. This renovation project has become a new paradigm in healthcare design, integrating the healing garden as part of healthcare and blending into the larger environment of the hospital for children.

Figure 13 The Ann & Robert H. Lurie Children's Hospital

Source: ideabooomweb, available from *https://www.ideabooom.com/8161*

SOS Kinderdorf International is an international private charity organization that aims to raise orphans in a family-like manner. SOS Kinderdorf USA combines the functions of foster family services and community family services according to the specific needs of its clients (Figure 14). The building features an ample, multi-level public space as a way to encourage children to participate in a variety of studies while also enhancing their social interaction. The spacious double-run staircase ensures the safety and can be used as a classroom or seating for performances; the large second-floor room can be used as a multi-purpose room for teaching, sports, and meeting functions; and the daycare classroom on the first floor is well-integrated, bringing the outdoor scene directly inside, opposite the outdoor playground. Due to budgetary constraints, the interior can be somewhat decorative, and the architectural design must directly express the materials.

Figure 14 SOS Kinderdorf International

Source: sos-kinderdorfweb, available from *https://www.sos-kinderdorf.ch/*

(3) Outdoor Places for Children in the UK

To improve children's physical health and increase their love of outdoor activities, the UK has redesigned and renovated children's activity sites to attract more children to participate in outdoor activities. These sites are designed around "building an experiential environment for children to grow up," with a humanistic approach guiding the site planning and design. Edicaff Park, located in the southwest of Sheffield, has been renovated to consider the number and age of children participating in activities. The park is designed to meet the needs of team activities but also has space for individual children; there is ample space for older children, but the materials chosen are plastic and fine sand that can protect young children (Figure 15).

Figure 15 Edicaff Park

Source: Garden Magazine, Gan &Long (2011), Humanized design of outdoor activity areas for children in the UK

In addition to meeting the needs of different people, children's activity venues in the UK also try to set up activity facilities according to the original characteristics of the site while using natural materials to make play facilities to convey the concept of rustic and healthy.

(4) Exploring Children's Outdoor Playground Design in Australia

Ian Potter Children's Wildlife Park is Australia's first children's themed playground and a new playground in Sydney's Centennial Park, located within the Centennial Parklands Learning Centre. This 6,500-square-meter site officially opened in October 2017 with crucial creative elements: adventure, fun, and playfulness (Figure 16).

Figure 16 Ian Potter Children's Wild Playground

Source: voooodweb, available from *http://www.vooood.com/list/post/551238/*

Spatial diversity: The case is designed with various attractive spaces based on children's nature and behavior. The design also considers combining children's play space with parents' care and rest space.

Unstructured play: Unstructured play is a type of free play by children that is essential for their healthy development; it may encourage the development of children's creativity while also better mobilizing children's participation and strengthening their sense of self.

To compensate for children's "nature deficiency," with nature as the background, the original purpose is to encourage children to reconnect with nature and increase their exposure to nature, not just to provide a place to play outdoors. Over 12,700 trees, shrubs, succulents, grasses, and groundcovers are planted throughout the park to form a unique flora, with more than half of the plants coming from native Australia, most of which are unique to Sydney.

Although the background of this case is foreign, its design strategies and concepts are worth studying. Foreign nations emphasize children's exposure to the outdoors and the development of their adventurous spirit, which is beneficial for the growth of their physical functions and psychological health, which is also the design aim of this work.

(5) Exploring the Design of an Outdoor Playground for Children in Germany

Eiger Park is located in Erfurt, central Germany. The whole project covers an area of 5.4 hectares, and the design is presented as a "farm" where children can experience the fun of nature and agriculture in the park. The designer's sketch shows that the play facilities in this space are designed according to the development process of crops from seed procurement to maturity, which evolves into various games to keep the children entertained and meet their cognitive needs (Figure 17).

Figure 17 Eiger Park designer's hand-drawn manuscript

Source: sos-xiaohongshuweb, available from *https://www.xiaohongshu.com/explore/63be444b000000001e03dae5*

Activate the historical and cultural heritage of the site: Erfurt has been an important trade area since the Middle Ages and has a deep history and culture. The designer used a childlike approach to integrate the play function with the history and culture; as shown in Figure 18, the park's entrance road is covered with plants and prints inspired by the goods falling from the horses back then. Secondly, the pond in the design site belongs to the cultural heritage; the designer added some props under the condition of protecting the original state of the pond, and turned it into a "floating duckweed" paradise, which realized the play function of the site for children (Figure 19).

Figure 18 Plant prints on both sides of the road at the entrance of Eiger Pa

Source: sos-xiaohongshuweb, available from

https://www.xiaohongshu.com/explore/63be444b000000001e03dae5

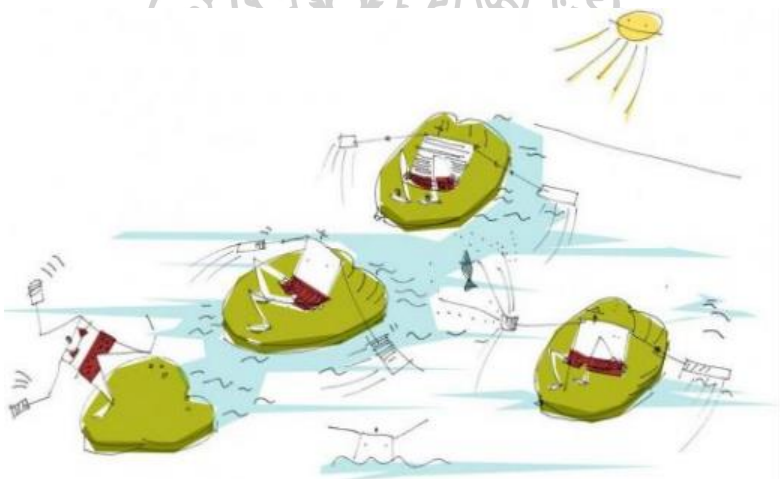


Figure 19 Eiger Park "floating duckweed" park

Source: sos-xiaohongshuweb, available from

https://www.xiaohongshu.com/explore/63be444b000000001e03dae5

Strong sense of experience and interaction: The whole space is full of childlike amusement facilities for children and adults to enjoy themselves. Children can have a rich experience when playing and deepen their interaction and communication with others through cooperation and promoting their emotional development (Figure 20).

Figure 20 Eiger Park experience interactive area

Source: sos-xiaohongshuweb, available from

https://www.xiaohongshu.com/explore/63be444b000000001e03dae5

Children can be close to nature: almost all the materials and paving materials of the amusement facilities in the venue are natural materials, such as wood, sand, earth, stone, and other natural and harmless materials taken from nature, so that children have a safety guarantee and are fully close to nature. Secondly, the shape of the amusement facilities is simulated crops and plants so that you can experience the joy of the field.

The case is designed from the children's point of view so that children can fully feel the fun, safety, and natural experience. In terms of site culture, it respects the history and culture of the site, activates the cultural memory of the site, and continues the site culture in a new and exciting way; in terms of facility shape, it is attractive, safe, and in line with the scale of children; in terms of material use, it uses a lot of natural materials. In general, all components of this case have considered the demands of kids having fun, which is notably worthy of mention and investigation in this article.

2.4 Regionality Concepts and Ideas

2.4.1 Overview of Regionality

China is not only a vast territory but also a multi-ethnic country. In terms of architectural culture, it is influenced by factors such as geographical location (Neuman, 2000), which leads to specific differences in the architectural planning and design of different ethnic groups. Studying the architectural design characteristics of

each ethnic group helps to strengthen the understanding of ethnic culture and ethnic history and promotes the improvement of national cultural self-confidence (Chongyun et al., 2022). New rural construction has been promoted in China for many years, and many rural builders with vernacular culture have emerged to find a way to balance modern architecture and vernacular life in new rural construction (Yajie, 2022). By analyzing regional-related issues and regional characteristics in architectural design, reasonable design methods that can reflect the regional characteristics of architecture and strategies to improve the quality of architectural space design are proposed to provide a reference for future architectural space design and development in China (Dan & Shujuan, 2021).

Ethnic architecture is an architectural project with characteristics in the planning of the region, an essential part of architectural culture, and an architecture that incorporates the culture of the nation and regional characteristics into many aspects of the building to build an architecture with ethnicity and regional characteristics. Therefore, when constructing such buildings, pay attention to the diverse expression of national culture, the diverse presentation of regional characteristics, and the emphasis on cultural belonging (Yi & Meng, 2021).

In the backdrop of China's construction industry's constant expansion, as designers and construction companies, it is vital to strengthen the study of the actual local situation. Incorporating local culture into architectural design often leads to more significant gains (Changping, 2022). From the current situation of the regional architectural culture of Henan residential buildings and the value of Henan regional architectural culture, the study was carried out to conclude the effective implementation of sustainable development planning by improving the idea of regional architectural culture inheritance in Henan residential buildings, solving the symbiosis between traditional architecture and the regional environment, integrating regional architectural culture in modern architecture, and developing Henan regional architecture (Dongjun, 2022). For the use of regional cultural elements in interior space furnishing design, we take the method of example analysis, develop specific discussion, and propose strategies for using regional cultural elements (Nan, 2021).

Considering architectural Regionality as the starting point, three principles of regional design for modern architecture are proposed: response to the natural

environment, response to the humanistic environment, and reasonable selection of building materials and technology (Fanji & Jue, 2021).

Architectural decorative art incorporating regional characteristics is an important research topic in contemporary architectural design, and the intention of decorative art in architectural design is revitalized through the layout of architectural space forms, the decorative techniques of enclosing interfaces, and specific regional elements, such as local materials and handicraft techniques (Fei, 2021).

2.4.2 Regional Design Connotation

2.4.2.1 Human-Centered, Human Place

A philosophical concept known as "human-centered" design is the design of human basics, and the critical point that needs to be concerned with and reflected in the design of activity spaces for left-behind children (Gasson, 2003). Human-centered means that the design process should be centered on human needs and experiences, emphasizing people's subject position and participation. In the design of activity spaces for left-behind children, human-centered design is reflected in paying attention to children's feelings and needs, respecting children's personalities and values, and fully considering children's physical and psychological characteristics. For example, the activity center for left-behind children should be designed with appropriate content and activities, fully considering children's interests and abilities so that children can participate, have fun, and grow.

"Human place" means that the design process should focus on the space's humanization, emotion, and culture, emphasizing the harmony and interaction between people and the environment (Buttimer & Seamon, 2015). The notion of a compassionate place is represented in the design of an activity room for left-behind children by providing a warm, welcoming environment, comfortable, safe, and welcoming activity places where children may freely express themselves, talk and engage, and feel a feeling of belonging and trust. For example, an activity center should provide a warm and welcoming environment so that children feel cared for and appreciated while simultaneously taking safety precautions to protect the safety of children within the center.

At the same time, people-oriented, humane places can also be shown as a design for human care so that people feel warm and comfortable, which is designed

with the use of people as the starting point in the process of people using other emotions, which is required from ergonomics and architectural design specifications. Therefore, the design distinguishes different genders, ages, interests, and psychological and other aspects of factors in line with people's psychological requirements.

2.4.2.2 Respect Nature and Reflect Nature

The relationship between architecture and the surrounding environment should be separated (Changping, 2022). For a long time, people have built buildings through their understanding of nature, and the natural differences between places could not be more obvious (Tong, 2003). Hence, the design of regionality is inevitably inseparable from the expression of nature, thus forming a design with local characteristics. Therefore, in the design, designers need to consider the natural conditions of the place. Most of them start with elements such as climate, topography, and vegetation.

Respecting nature and reflecting nature in the connotation of regionalism means fully considering the natural environment in the design process, organically combining architecture with the natural environment, and creating a place that coexists harmoniously with nature. Consideration of the natural environment when designing spaces for children left behind. This can be reflected in the following areas.

Natural light and ventilation should be thoroughly addressed while constructing the playroom for left-behind children, such as the appropriate setting of windows, skylights, and light wells, so that the interior has sufficient light and air circulation to create an excellent natural environment. Natural and environmentally friendly materials should be used as much as possible, such as wood, bamboo, and hemp rope, to avoid using too many chemical materials and protect the natural environment. A natural landscape can be used to increase the interest and attractiveness of the activity space, such as by building in places with beautiful natural landscapes and setting natural playgrounds so that left-behind children can enjoy the beauty of nature in their activities.

To sum up, respecting nature and reflecting nature in the context of regionalism is one of the design concepts that should be followed when designing the activity space for left-behind children. Using natural resources, we can create an activity place that coexists harmoniously with nature and provides an excellent natural environment for left-behind children.

2.4.2.3 Expression of Native Land and Inheritance of Humanities

Expressing the vernacular and passing on the humanities means incorporating local culture, tradition, and history into the design to help children better understand and respect their place and culture (Tong, 2003) .

One must recognize the elements of human existence in the vernacular to deliberately show the simple externalization of the vernacular humanities without digging deeper into the inner spiritual meaning of the vernacular humanities (Dan & Shujuan, 2021). Therefore, we need to integrate the local cultural symbols in the design and reflect them in the place through the communication of design imagery, considering various factors such as local humanities and the natural environment. The design is based on the site, expressing the vernacular and inheriting the humanities (Figure 21).

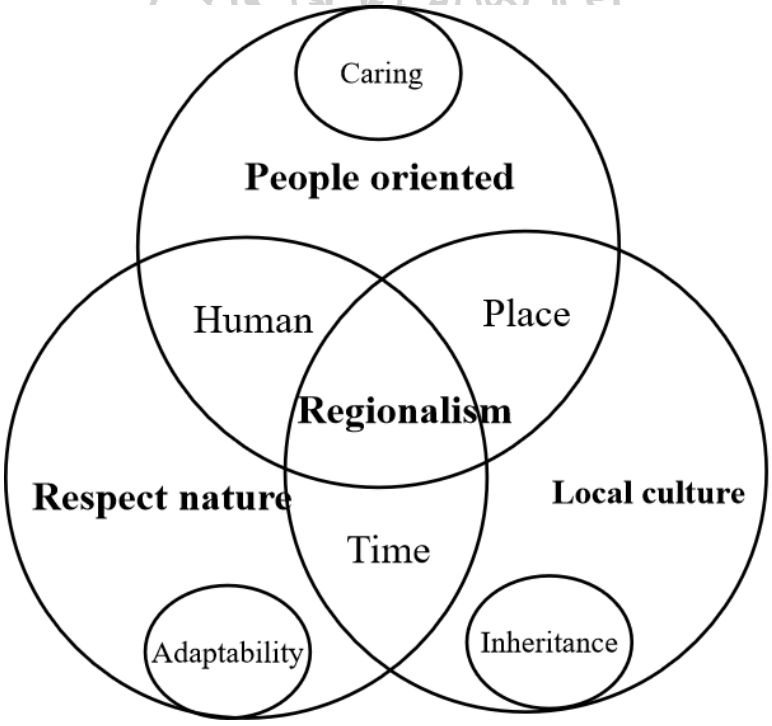


Figure 21 Regionalism design

Source: Self-drawn by the author, 2022

As mentioned above, the design connotation of regionalism corresponds to the design practice based on the region, as shown in Figure 21, embodying three aspects of nature, culture, and people, which are the basis of regionalist design. These three aspects are the relationship between "people," "place,"

and "time" in geography: "People": human-centeredness (human needs, sensory experience, behavioral scale), the caring nature of designing for people; "place": respect for nature (climate, topography, geography). Respect for nature (climate, topography, vegetation): adaptability to the natural environment; "time": local humanities (history, culture, folk customs): the inheritance of local culture.

2.4.3 The Relationship Between Regionalism and Rural Environment Design

Regionalism is a design concept that emphasizes local characteristics and cultural heritage, focusing on integrating design with the local environment and social culture (Nan, 2021). The rural environmental design also integrates design with the local environment, culture, and social (Yajie, 2022)context to achieve sustainability (Table 4).

Table 4 The relationship between regionalism and rural environmental design

Features	**Regionalism**	**Rural environment design**
Design Concept	Emphasis is placed on local cultural, historical, and environmental characteristics, promoting the harmonious development of nature, humanity, and society.	With the countryside as a backdrop, the focus is on integrating into the environment, respecting local culture, and creating comfortable spaces and lifestyles.
Design Objectives	The design reflects the regional culture, protects the traditional cultural heritage, and raises awareness and understanding of the local culture.	The design fosters rural economic growth and enhances people's quality of life by creating a comfortable and pleasant rural environment.
Design Elements	The architecture, landscape, and public spaces are designed with regional culture as an element to create places and environments rich in character.	The village layout, architectural style, and public facilities are based on the environment and focus on localizing materials and cultural symbols.

Features	Regionalism	Rural environment design
Design Thinking	It advocates a people-centered approach and focuses on designing humane places so that people can feel the unique charm of the local culture, environment, and history.	Emphasis is placed on the harmonious coexistence of nature and humanity, respecting the relationship between the environment and people, and creating a livable space that blends with nature.
Design Effect	It enables people to have a more profound knowledge and understanding of the local culture and environment and promotes the transmission and development of regional culture.	To create a livable and pleasant rural environment, promote rural economic development, and improve residents' quality of life.

For example, in a rural setting, regionalist design may consider local architectural styles, traditional culture, and the natural environment to create designs with local characteristics that meet people's needs and lifestyles. Such designs can inspire a sense of pride and identity among residents and promote community cohesion and development.

Therefore, in rural environmental design, the design concept of regionalism can help designers better understand the local environment and culture to create more adaptive, sustainable, and aesthetically pleasing design solutions.

2.4.4 Regionalism and the Construction of Expressions in Rural Design

Find indigenous design inspiration and elements in the local culture, history and environment to create buildings and landscapes with regional characteristics (Fanji & Jue, 2021). Draw on local traditional architectural styles and techniques, as well as modern design methods, and blend them together to create buildings and landscapes that are both contemporary and expressive of regional characteristics (Heath, 2009). It can also emphasize the natural and humanistic values of the rural environment, focusing on protecting and emphasizing the local ecosystem and cultural heritage in the design

(Väyrynen, 2003). Focus on the humanized design of buildings and landscapes, considering the needs and feelings of users, as well as the characteristics of local communities and cultures. Advocate the design concept of sustainable development, taking seriously the rural environment's ecological, economic, and social implications, as well as the plasticity and adaptability of the design for future development.

Overall, the construction of expressions of regionalism and rural environmental design needs to fully consider local environmental, cultural, social, and economic factors in order to create architecture and landscapes that are locally distinctive, ecologically sustainable, and humane.

2.5 Related Studies

2.5.1 Data and Methods

2.5.1.1 Data Sources

The data for this study were drawn from the core collections of CNKI (China National Knowledge Infrastructure) and WOS (Web of Science).

The advanced search was conducted in CNKI journals with two groups of keywords: one with "left-behind children" and "design" as the themes in Figure 22, and the other with "children's activity space" and "design" as the themes in Figure 23. "The relationship between each group of keywords was and," the search scope was Chinese literature, and the time range was from June 1, 2012, through June 1, 2022. On June 1, 2022, the total number of literatures retrieved in the two groups was 1397, of which 376 were journal papers with topics or fund-funded research results, accounting for 27% of the academic literature on the design of activity rooms for children who are left behind, which shows that governments and organizations have not well received the research on the design of activity rooms for kids who are left behind at all levels. In addition, unrelated to the issue, the data analysis included research literature on rural left-behind junior and senior high school students, teaching curricula for left-behind children, and mobile children. Finally, 939 valid documents were screened, and the valid documents were exported in the format of RefWorks and renamed as the research sample.

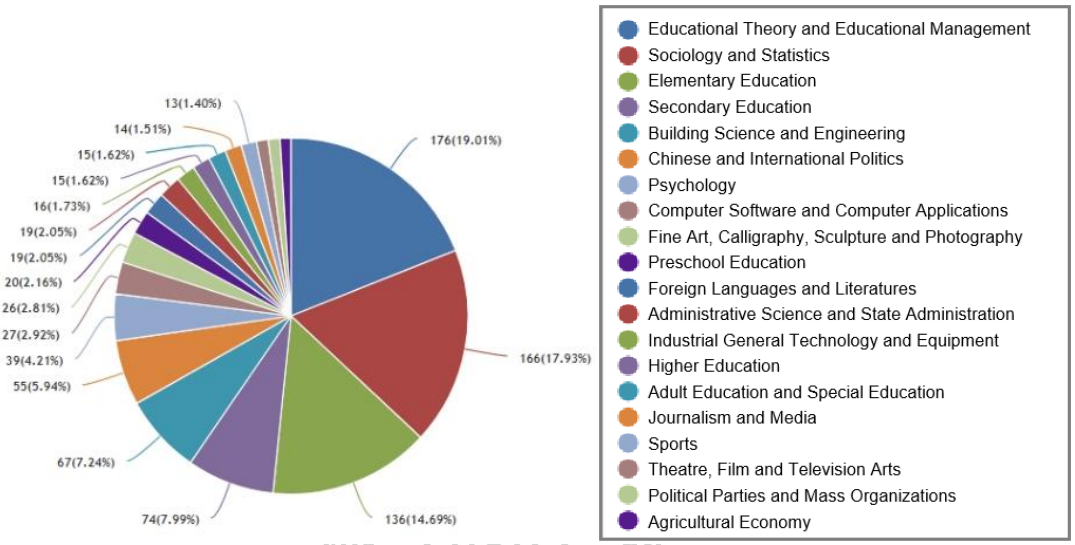


Figure 22 Distribution of study publications by discipline on the subjects of "left-behind children" and "design"

Source: China National Knowledge Infrastructure, 2022

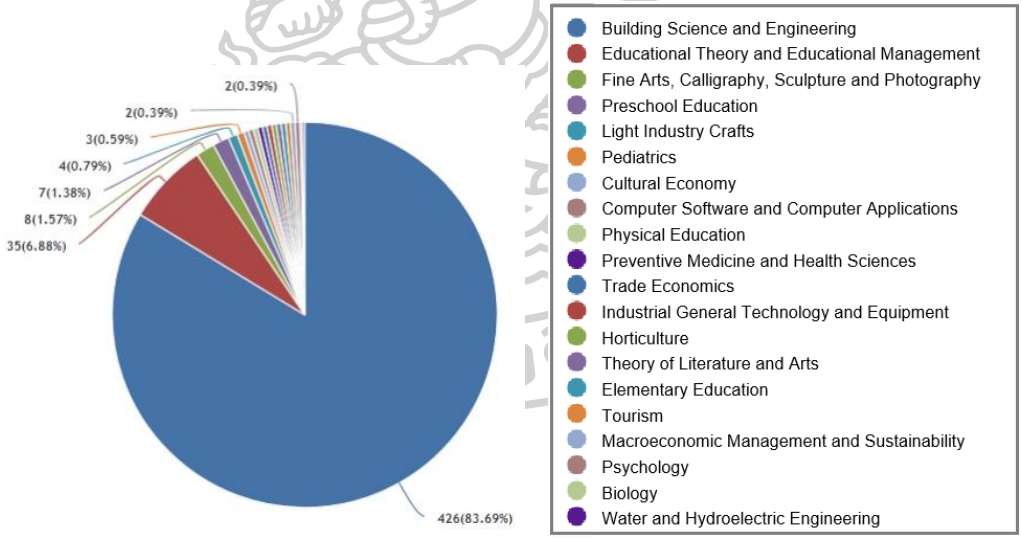


Figure 23 Distribution of research literature on the themes of "children's activity space" and "design" by discipline

Source: China National Knowledge Infrastructure, 2022

In the WOS literature data, search in "Web of Science Core Collection," Editions for All, search for the topic: "left-behind children" or "children

left behind" or "stay-at-home children" and design the document types available are "Article" and "Review". The document is only available in "English" and has a publication date of the search found 69 authentic documents dating back to January 1, 2011, to December 31, 2021, in Figure 24. The retrieved data were eliminated for non-academic literature and those not strongly related to the topic. Finally, four valid documents were selected and exported as plain text files with complete records and cited references.

Figure 24 Annual trend of wos literature publication children" and "design" by discipline

Source: Web of Science,2022

During the ten years, the CNKI and WOS databases were screened to find 939 valuable articles in the CNKI database and 4 in the WOS database. The comparison of the data reveals that because there are few "left-behind children" in other countries, in other nations, there needs to be more research on the design of facilities for left-behind children, except for China. Therefore, the following analysis focuses on the design of spaces for left-behind children in China.

2.5.1.2 Methodology

CiteSpace visualization software, developed in 2004 by Chaomei Chen, a prominent Chinese American and tenured professor at Philadelphia University, is used for literature analysis in this work. Scholars mainly use the software when researching scientific literature for visual identification and to show new trends and

developments in scientific development. It can contribute to the prospective knowledge in the field of study on the design of activity spaces for children who have been left behind. The software runs to generate a visual graph, the "scientific knowledge map," which visualizes the relationships between the literature in the form of a subject knowledge map. A deeper analysis of the visual map allows for an understanding of the research lineage and history of this research area, the current state of development, research hotspots, future trends, and which research topics will explode.

2.5.2 General Overview of the Study

2.5.2.1 Analysis of the Volume of Articles Issued

Figure 25 shows a graph showing annual trends in the study literature on the design of activity centers for children. It shows the chronological change in the volume of research literature in this area published at CNKI. From 2012 to 2022, 1397 articles were retrieved, starting with 23 articles in 2012 and then a steady trend from 2012 to 2015, with a gradual increase in 2016, with a peak of 217 articles in 2022. This shows that the study of activity space design for left-behind children is gradually gaining attention from Chinese researchers.

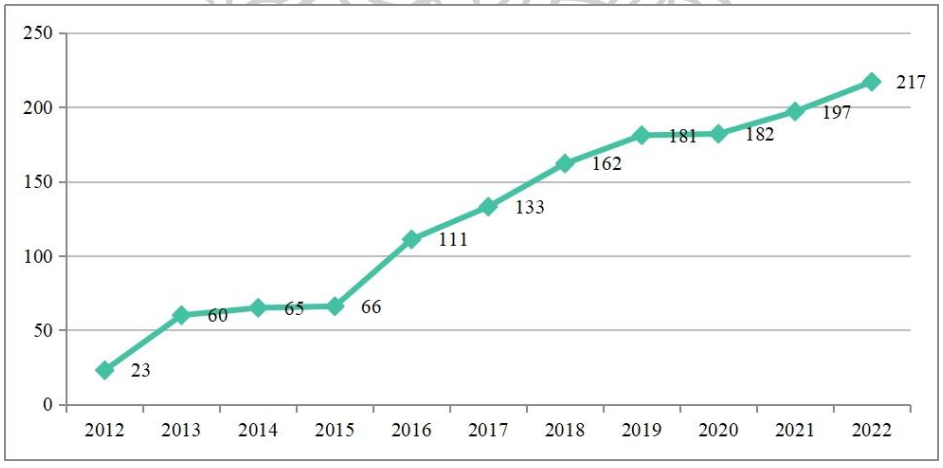


Figure 25 Annual trend of published literature on the design of activity spaces for left-behind children

Source: China National Knowledge Infrastructure

However, among the 1397 pieces of data, some of them were published on the education of left-behind children, safety, psychology, government policies, and teachers' classroom teaching, which were not strongly related to the topic

of this study. A total of 939 pieces of valid data were selected, including 306 pieces of journal literature (32.6%), 627 pieces of master's literature (66.8%), and six pieces of doctoral literature (0.6%). The average number of authors is 3.2, with 229 institutions and 295 authors involved. The most significant number of articles institutions publish is from Anhui University, with 39 articles. Of the valid data, 753 papers were signed by a single author, accounting for 80.1% of the total literature, and 186 papers were signed by two or more authors, accounting for 19.9%. This shows that research on the design of activity centers for left-behind children has yet to be studied collaboratively among Chinese research scholars. However, according to the trend graph, researchers in this field have also increased their attention in recent years.

2.5.2.2 Analysis of Research Hotspots

The size of keyword word frequency can well reflect the research hotspots in the field at that period, and keyword overlap analysis aids in understanding the field's research direction. CiteSpace software was used to analyze the keywords in 939 papers, and LRF (Link Retaining Factor) was set to 1 to retain the line with the greatest strength of relationship, LBY (Look Back Year) was set to 8, and Pathfinder (pathfinding algorithm cropping) was chosen as the graph network cropping method. The node number is 344, the lines number is 551, and the density is 0.0093. The node's size indicates the number of keyword occurrences: the more occurrences, the larger the node. When the probability of other keywords co-occurring in the literature, and the greater the influence in the co-occurrence network, the higher the centrality of the keyword will be, and the darker the color of the edges of the circle Figure 26. As a result, Table 1 contains the top 20 keywords in terms of centrality. The keywords that appeared more frequently than 10 were left-behind children, children, group work, activity space, landscape design, spatial design, residential area, design, rural, kindergarten, public space, child-friendly, resilience, children's activities, social work, outdoor activities, mental health, and design strategies. This represents academic research hotspots and frontiers in the spatial design of activity centers for left-behind children, as well as the diversity of research on the socialization of left-behind children.

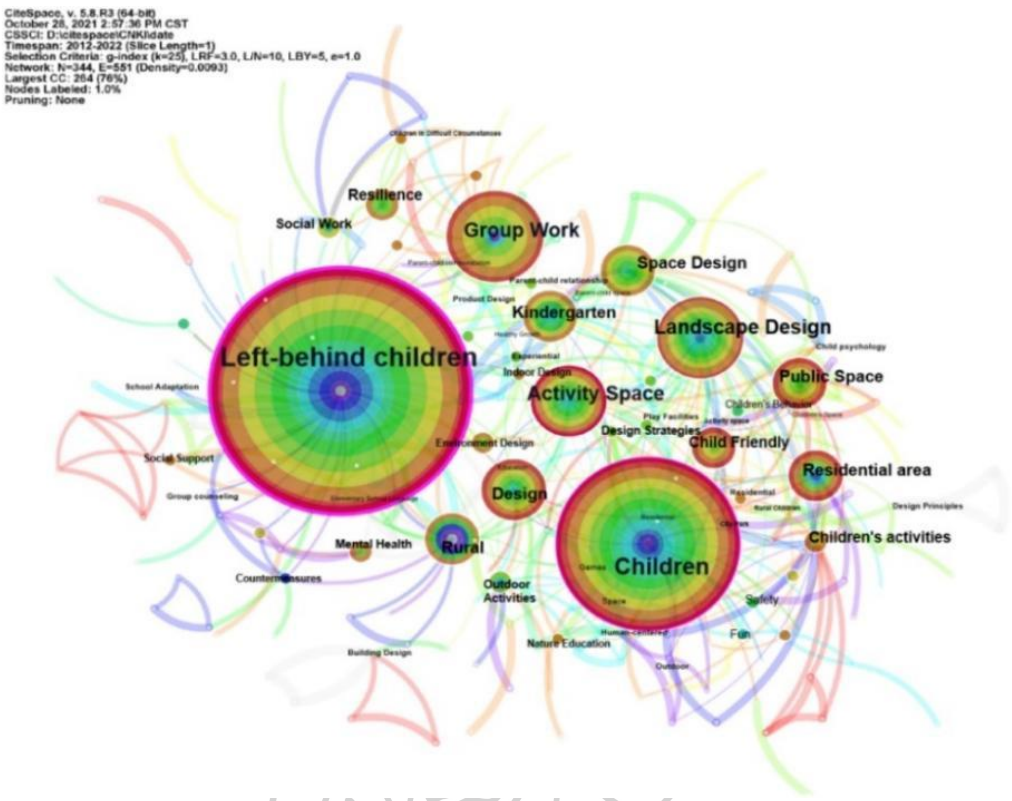


Figure 26 Keyword co-occurrence mapping

Source: Produced by the author from CiteSpace, 2022

As can be seen from Table 5, the top 20 keywords related to children are: "left-behind children," "children," "child-friendly," "resilience strength," and "mental health" (centrality 0.74, 0.27, 0.01, 0.01, 0), and design-related: "landscape design," "spatial design, "design" "design strategy," "interior design" (centrality 0.17, 0.07, 0.07, 0.01, 0.03), and to children's activity spaces: "activity spaces" "public spaces" "children's activities" "outdoor activities" (centrality 0.14, 0.06, 0.05, 0.06, respectively), and those related to rural areas: "residential areas" "rural" (centrality 0.06, 0.06 respectively). "Left-behind children" are the subject of study on the design of activity areas for left-behind children in terms of frequency of occurrence (211 times), and this keyword appears most frequently, with the top 10 keywords appearing 20 times or more and the 10-20 keywords appearing nine times or more.

Table 5 Top 20 keywords for centrality

Sequence Number	Count	Centrality	Keywords	Year	Sequence Number	Count	Centrality	Keywords	Year
1	211	0.74	Left-behind children	2012	11	19	0.06	Public spaces	2018
2	102	0.27	Children	2012	12	18	0.01	Child friendly	2016
3	52	0.09	Group work	2013	13	17	0.01	Resilience	2016
4	42	0.14	Event space	2012	14	15	0.05	Children's activities	2013
5	40	0.17	Landscape design	2013	15	13	0.02	Social Work	2012
6	25	0.07	Space design	2015	16	12	0.06	Outdoor activities	2013
7	25	0.06	Residential areas	2013	17	12	0	Mental Health	2012
8	21	0.07	Design	2016	18	11	0.01	Design strategy	2017
9	21	0.06	Rural	2012	19	9	0.03	Interior design	2015
10	20	0.08	Kindergarten	2013	20	9	0.01	Security	2016

According to the findings, the research hotspots in China for the study of activity spaces for left-behind children include "left-behind children," "rural areas," and "design." Simultaneously, there is a four-year lag between the development of "left-behind children" and the concept of "design." There is a four-year gap between the introduction of "left-behind children" and "design," implying that design for left-behind children was only a concern four years after the emergence of "left-behind children." In recent years, there has been an increase in interest in and refinement of studies on children left behind in rural regions, as well as the creation of activity spaces.

In terms of Count content, on the one hand, high-frequency terms that are similar in meaning to the search terms "left-behind children," "design," and "children's activity spaces" include "activity space," "space design," "rural," "child-friendly," "children's activities," On the other hand, high-frequency words reflect the research on social support for children's activity spaces in the following ways:

(1) The terms "rural population," "children's activity space," and "children left behind in rural areas" represent the fact that the majority of the children left behind are from rural areas and are the outcome of the continuing building of rural areas following the implementation of rural revitalization in China. This is a phenomenon that has intensified.

(2) The phrases "group work," "social work," and "mental health" appear frequently, indicating that social assistance is actively investigated in the case of left-behind children. Parent-child connections, peer relationships, and other sectors can all benefit from social assistance. The psychological influence of social support on left-behind children is now the focus of research in psychology on social support for left-behind children. The more social support people have, the less lonely they feel and the more subjectively happy they are. The less social support they have, the more likely they are to develop "problem behavior." Other factors influencing the psychological impact of social support on left-behind children include "coping styles" and "mental toughness."

(3) Interventions for social support for children left behind: "educational services," "social work."

In short, left-behind children's physical and emotional health, educational concerns, social support, influencing factors, social support from NGOs, and various measures of government policies for left-behind children are all topics that can be studied in increasing depth in the study of left-behind children.

2.5.2.3 Keyword Clustering Analysis

Research hotspots represent the inherent relationship between a particular era and a specific research area, as well as the focus and direction of study in the field, which is critical for a thorough knowledge and analysis of the research material in this subject. Using clustering statistics, the keyword co-occurrence network linkages are reduced based on keyword co-occurrence analysis into a relatively small number of clusters.

This study used keyword cluster analysis to investigate the research hotspots of "left-behind children" and "design," "children's activity space," and "design" to investigate the hot issues of research in this sector in China.

The specific clustering labels are analyzed through Big Data CiteSpace software operations, and the "LLR log-likelihood algorithm" is selected to generate a clustering view of the keywords. The keywords are reorganized to produce large clusters where keywords with prominent relationships converge, reflecting the similarity between nodes. The current research focus is analyzed according to the algorithm's results. The network modularity measure displays a modularity Q value of 0.6266 from the plots in Figure 27, with a value greater than 0.3 suggesting considerable clustering structure and excellent clustering. The S value of the mean silhouette, a measure of network homogeneity, is 0.9146, with a value greater than 0.7 suggesting compelling and excellent clustering findings. This suggests that the values for the research topics "left-behind children," "design," "children's activity spaces," and "design" are within a tolerable range. With a high degree of concentration and a considerable influence, the clustering effect is seen.

The aggregation of 10 research themes on the design of activity spaces for left-behind children, numbered 0–9, is shown in Figure 27. The overlap between the topics implies that research on developing activity areas for left-behind children in China has evolved beyond a single theme in the previous decade. For example, the phrases "left-behind children" cluster: children, group work, social support; and "design" cluster: landscape design, design concepts, architectural design, product design. The "children's activity space" clusters are public and experiential spaces. Further analysis of the clusters follows. Appearing nine times or more.

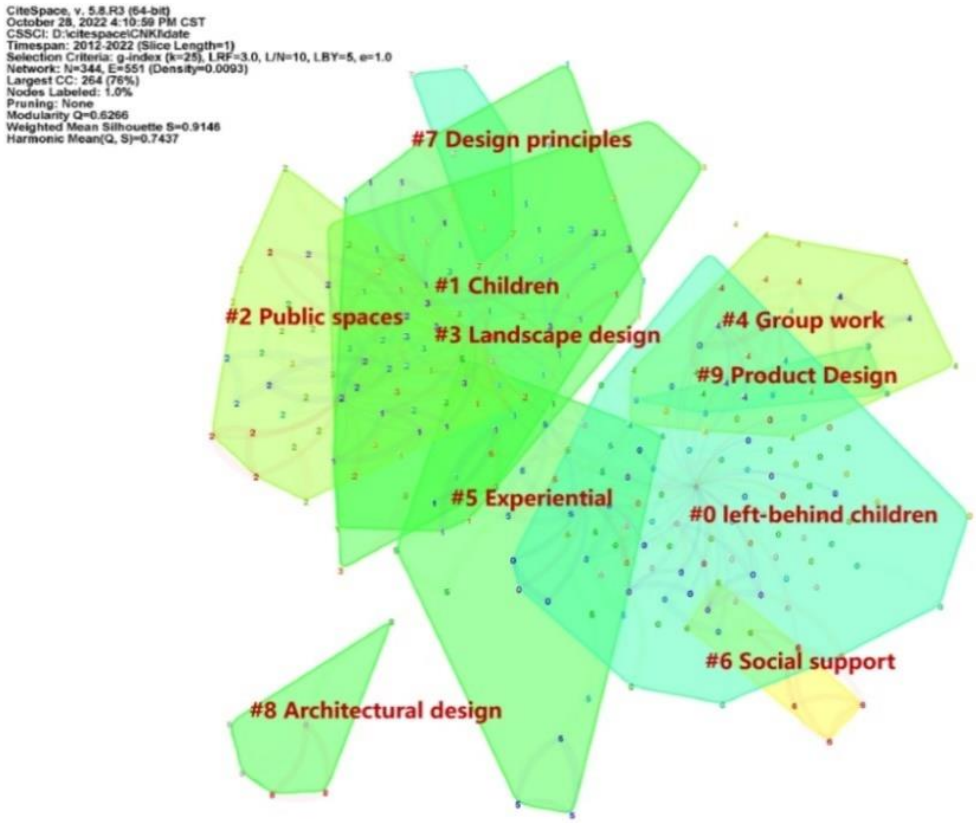


Figure 27 Keyword clustering scientific knowledge mapping

Source: Produced by the author from CiteSpace, 2022

To produce the keyword co-occurrence network clustering table in Table 6, the log-likelihood ratio was derived using "Cluster Explorer" (one of the clustering tag word extraction strategies).

Table 6 List of keyword co-occurrence network clusters

Cluster ID	Size	Silhouette	Label name	Year	Top Terms (LSI) (partial selection of the top five)
#0	79	0.996	left-behind children	2016	Left-behind children; Maslow's Hierarchy of Needs; Communication design; Rural junior high schools; Executive function
#1	50	0.855	Children	2016	Outdoor space; Animated elements; Landscape evaluation; Dezhou Xinhu; Children's needs
#2	37	0.87	Public spaces	2017	Children's activities; Space design; Urban Park; Environmental design; Rural children's activity space
#3	27	0.851	Landscape design	2016	Landscape design; Activity space; Residential district; Ribbon polycentric; Under the Sun
#4	26	0.893	Group work	2017	Group work; Left-behind children; Interpersonal interaction; Social work; Emotional vulnerability
#5	21	0.866	Experiential	2016	Environmental design; Design principles; Activity space; Children's aesthetic education; Emotional needs
#6	7	0.994	Social support	2020	Social support; Mediation effects; Mental toughness; Intervention studies; Impact effects
#7	6	0.979	Design principles	2015	Design principles; Design elements; Children's outdoor play spaces; Tropical cities; Outdoor spaces
#8	6	0.948	Architectural design	2016	Architectural design; Creative interaction; Social activities; Youth centers; Active spaces
#9	5	0.989	Product Design	2016	Product design; Children left behind; Urban environment; Public facilities; Children's products

The detailed analysis is as follows.

(1) Studies Related to "Left-Behind Children" (#0, #1, #4, #6)

This cluster examines the living environment of children left behind, encompassing the environment in which they grow up, care, children's needs, mental health, interpersonal interaction, and social support.

With both parents working outside the house, there are more left-behind children, and parents working outside the home might render the family structure incomplete, so intergenerational guardianship has become a common phenomenon and a major social problem faced by Chinese society in the transition from traditional to modern. Studies have shown that grandparenting could be both efficient and problematic due to ideology, educational style, expectations, and the limitations of objective resources (Min, 2013). Secondly, in traditional Chinese culture, the family education of strict fathers and kind mothers is especially emphasized. In the case of one of the parties going out to work, the fathers go out in the majority, which causes the absence of the father's role. The fathers represent infinite strength and firm reliance in the eyes of the children. Children will experience psychological uneasiness to varying degrees when the father's involvement weakens and disappears. The impact of parents leaving their children to work is sometimes positive. It can, for example, enhance family income, improve disadvantaged children's survival environment, and foster their sense of independence. The study shows that working outside the home can increase family income. However, the positive effect of income increases cannot offset the negative effect of a lack of parental accompaniment (Zhiqiang & Jun, 2019). According to the data above, China's research on classifying left-behind children was successful. However, more study on the unique condition of left-behind children is required.

We investigate the development trend and the concepts and techniques of camping school space, which are favorable to the healthy development of left-behind children's physical and mental educational environment, from the perspective of the study of left-behind children in the countryside (Peiyong, 2011). It solves real problems from a psychological perspective and provides new ideas and methods for the psychological development and educational problems of left-behind children (Chuanjing, 2015). Comprehensively analyze the health problems and causes of left-behind children from physiology, psychology, and social adaptation and construct a more complete and systematic theory (Xingyue, 2021).

In the study of mental health education problems and countermeasures, the current mental health problems of children in rural China are prominent, and the current situation of rural children's mental health education needs to be improved (Gaohua & Delin, 2019). Analyzed from a psychological point of view,

exercise has a specific effect on the intervention of left-behind children's loneliness, which can reduce the loneliness of left-behind children and is sustainable (Dashun, 2011). Folk games can be used to improve the ability of left-behind children to interact. Focus on establishing a sense of rules to promote the formation of interaction ability. Utilize game activities to develop language interaction ability; design cooperative games to cultivate a sense of helping others; and carefully observe and guide to improve left-behind children's interaction ability (Shoufang, 2019).

Compare and contrast the disparities in family functioning, perception of insufficiency, and mental health between left-behind and non-left-behind children (Shoufen, 2017). Regarding left-behind children's guardianship problems, grandparenting styles have a great relationship with preschool left-behind children regarding their emotional regulation ability (Daiyan, 2017). Relevant social work service plans are developed in response to the unfulfilled requirements of left-behind children's family education. The missing content of left-behind children's family education is compensated for through the execution of social work service projects, which encourages the development of social work service agencies and expands the social space to establish social organizations to some extent (Qinglin, 2019).

From the perspective of a dynamic life course, left-behind children at the beginning of personality formation, due to the environment and the subject of a certain degree of deviation, so that in the different stages of their growth in the socialization of a kind of anti-Erikson's law phenomenon (Youcai & Ping, 2011). From the perspective of Freud's theory of personality development, the level of socialization in the previous stage has a particular impact on the socialization process in the later stage, which will have an immeasurable negative impact on the shaping of their personality in the future (Tianming & Mingming, 2008); From the theory of non-social behaviors, we analyze the causes of non-social behaviors among kids who were left behind and put forward the corresponding auxiliary countermeasures (Yujun et al., 2005). The idea of national multiple personality is used to assess the contemporary socialization condition of rural left-behind young children. It is advocated that the state pay attention to the external environment of rural left-behind young children playing the function of kindergartens as well as the core and leading role and that parents be made aware of their duty for raising early children (Xueping, 2015).

There is also study and analysis from the major body of socialization to investigate the socialization of left-behind children, primarily from the perspectives of school, family, and mass media (Chunkao, 2012), through the investigation and practice of R city in southern Zhejiang, exploring the dilemma of socialization of left-behind children in rural areas and the countermeasures of school education, pointing out that the school is an essential place of socialization, with the advantage of standardized resources, and plays a solid leading role in the process of socialization of left-behind children in rural areas, and has a specific compensatory effect on the localizability. It is proposed that a lack of family education impacts the socialization of left-behind children in terms of gaining life skills, internalizing social norms, and building accurate value systems (Xiaoxia, 2012). An empirical technique was used to investigate the influence of mass media on the learning socialization of rural left-behind children (Xuemei & Yun, 2018). Other psychological research projects use positive psychology to conduct a comparative study of left-behind kids (Zhen & Lijuan, 2007), we demonstrate considerable disparities in self-esteem, sources of psychological control, and social adaptation between left-behind and non-left-behind children. Some academics have also focused on ethnic minority children who have been left behind. The socialization status of left-behind children in rural Ye Sanguan was discovered through fieldwork and case study research. (Shiping & Zhisong, 2013), the weakening of the family education function, the absence of the teacher's role function, and the inability of left-behind children to actively acquire socialization materials all hurt the socialization of left-behind children in rural regions.

Furthermore, there is research from the perspectives of knowledge education and ecology. In addition, studies on the families and education levels of left-behind children are given additional weight, and according to the keyword statistics, it can be reflected that researchers' studies on left-behind children's socialization focus more on family and education. Especially the academic results analyzed from the family perspective are rich; for example, the effect of parental absence on rural left-behind children's socialization (Yanqing, 2006), the investigation of the home environment and the propensity for socialization of rural left-behind children (Qiuxiang & Chuanxi, 2007); Considering the influence of the home environment on the learning and

socialization of rural children (Xuemei & Yun, 2018), and put forward the fact that the family has a vital significance for children's socialization that we cannot ignore.

(2) Studies related to "children's activity spaces" and "design" (#2, #3, #5, #7, #8, #9)

This cluster focuses on the study of the design of play areas for rural children who have been left behind. Contains keywords such as children's activities, spatial design, rural children's activity space, environmental design, activity space, rural landscape design, residential area design, design principles, design elements, architectural design, and product design.

The environment is critical for children's development, and various spatial contexts can aid in the development of left-behind children (Xiaojing, 2018). Functional symbiosis and cultural symbiosis are two aspects (Keke, 2019). To improve the overall development of left-behind children's growth (Shuo, 2019), coupled with China's intended urban-rural integrated development, building a children's activity space in the countryside exploits the benefit of idyllic natural resources to create a suitable country-experiencing environment for children (Wangwang, 2021) and taking natural experience as the starting point, combining natural experience with the behavioral and psychological characteristics of rural children (Jiali, 2018). The rural outdoor activity environment and left-behind children's psychological needs and behavioral characteristics. In rural landscapes, it is necessary to focus on regionality, emphasize guidance, increase interest, highlight ecology, and improve the ornamental outdoor activity space for left-behind children (Dong et al., 2018). General rural children's outdoor activity space is seldom artificially designed, needs prominent cultural and educational characteristics, and cannot play the role of humanistic education for children (Jiali, 2019). The physiological, psychological, and behavioral aspects of children's groups are analyzed, and child-friendly outdoor activity space design techniques are presented from the standpoint of humanistic care (Xin et al., 2022).

The design of rural activity centers for children who are left behind should focus on the space demands of left-behind children, the present environmental conditions of rural activity centers, and the lifestyles of rural left-behind children (Jiyu, 2015). There are additionally three ways for optimizing rural settlement planning and

design by studying the growth of rural family structure and settlement changes, establishing a settlement form that is compatible with the function of rural settlements for the elderly, building a home for children's growth, and building a safe and defensible living environment in settlements (Yong et al., 2015). The activity space for left-behind children should have an interaction design, accompanying children's growth and sending parents' love and care in order to make left-behind children no longer feel lonely (Jingjing, 2016). The commonalities and differences in the psychological development of children in the lower grades and the upper grades, respectively, the grasp of the spatial elements of the various types of public activity space in terms of spatial morphology, spatial scale, color, material, light environment, as well as furniture furnishings (Luofeng & Jiayin, 2018).

The design of activity centers for left-behind children should not blindly imitate traditional architecture but should condense traditional architectural symbols and integrate local architectural symbols with modern technology (Feifan, 2017). The issue of left-behind children is critical in Chinese society. On the one hand, the problem of left-behind children is an impediment and a difficulty for many children's development; on the other hand, it will harm society's stable development and the country's nation's future development (Leilei, 2019). The research results of many disciplines, such as children's behavioral psychology and physical and mental health development landscape environment ecology, are combined with the field study of children's outdoor activity space. The planning, design, and long-term development of children's outdoor exercise area is then methodically researched using theoretical guidelines (Ludan, 2016).

2.5.3 Research Frontiers and Trend Analysis

2.5.3.1 Research Frontiers

The research preoccupations and hotspots in a certain period can be reflected by the Burst terms, which are keywords that are suddenly cited more frequently in a certain period. Given this, to further study the development trend of activity space design research for left-behind children in China, CiteSpace was run with the parameter "Burstterms," and the γ value was set to 0.6 14 keywords were found for Burst items (Figure 28).

Top 14 Keywords with the Strongest Citation Bursts

Keywords	Year	Strength	Begin	End	2012 - 2022
Rural	2012	5.1	2012	2014	
Education	2012	2.28	2012	2014	
Responses	2012	2.19	2013	2014	
Outdoor Activities	2012	1.98	2013	2016	
Group Tutoring	2012	1.59	2013	2015	
Safety	2012	2.23	2016	2018	
Fun	2012	2.22	2016	2017	
Kindergarten	2012	1.98	2016	2017	
Space Environment	2012	1.98	2017	2018	
Children's Behavior	2012	1.72	2017	2019	
Child Development	2012	1.68	2019	2020	
Child Friendly	2012	1.56	2019	2022	
Public Space	2012	1.79	2020	2022	
Rural Primary Schools	2012	1.5	2020	2022	

Figure 28 Keywords with the strongest citation bursts

Source: Produced by the author from CiteSpace, 2022

As can be seen from the graph, the emergent words in the period 2012–2014 are "rural" and "education"; in the period 2013–2014, the emergent word is "kindergarten." The emergent word for the period 2013–2016 is "outdoor activities"; for the period 2013–2015, it is "group counseling"; "safety" for the period 2016–2018; "fun" for the period 2016–2017; "kindergarten"; the emergent word for the period 2017–2018 was "spatial environment"; the emergent word for the period 2017–2019 was "child behavior"; between 2019–2020, the emergent term is "child development"; between 2019–2022, the emergent term is "child-friendly"; "public space," "rural primary schools" for the period 2020–2022.

The significance of "public space" and "rural primary schools" has persisted to the current day, indicating that they will continue to impact the design of activity spaces for left-behind children in China for some time, becoming research hotspots and a key development trend.

2.5.3.2 Research Trends

The temporal keyword chart may display the significant study material of a research subject over time and the research trend over a specific period. Using keyword co-occurrence analysis, CiteSpace was then used to build a temporal keyword chart per time segment. According to Figure 29, the six clusters of keywords #0, #1, #2, #3, #4, and #5 have a specific temporal link and connectivity, showing some continuity and correlation in their research hotness. Clusters #1, #7, and #8's keywords do not form an obvious temporal horizontal line, and the temporal relationship is weak; cluster #9's starting and ending dates are 2016 and 2017, indicating that its research topic keywords are only stage research hotspots, and the continuity is poor. The five clusters, #0, #1, #2, #4, and #8, cover the period from 2012 to 2022, indicating that they are the most active and persistent. Regarding the time horizon of each cluster, the main keyword "left-behind children" appears first in cluster #0 and is the most influential. The most influential keywords in order of appearance are #1 'child," #2, "public space,' #3 'landscape design,' and #4. "The above keywords appear from 2012 to 2019, indicating that scholars' attention to the design of activity spaces for left-behind children is rising. On average, one new keyword emerges each year. This shows that the research on this cluster is gradually gaining attention from society.

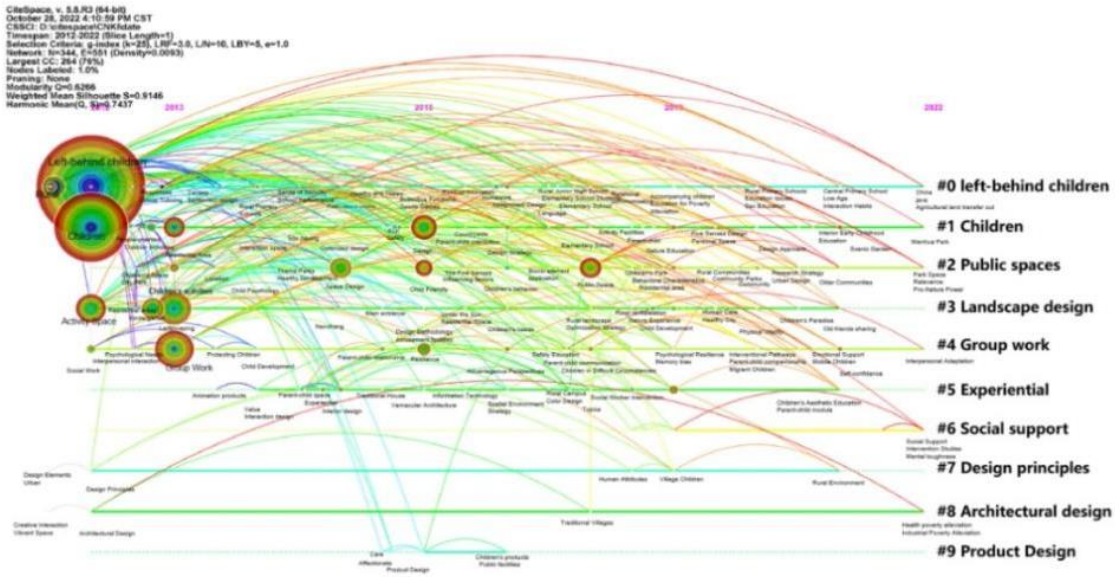


Figure 29 Keyword timeline analysis

Source: Produced by the author from CiteSpace, 2022

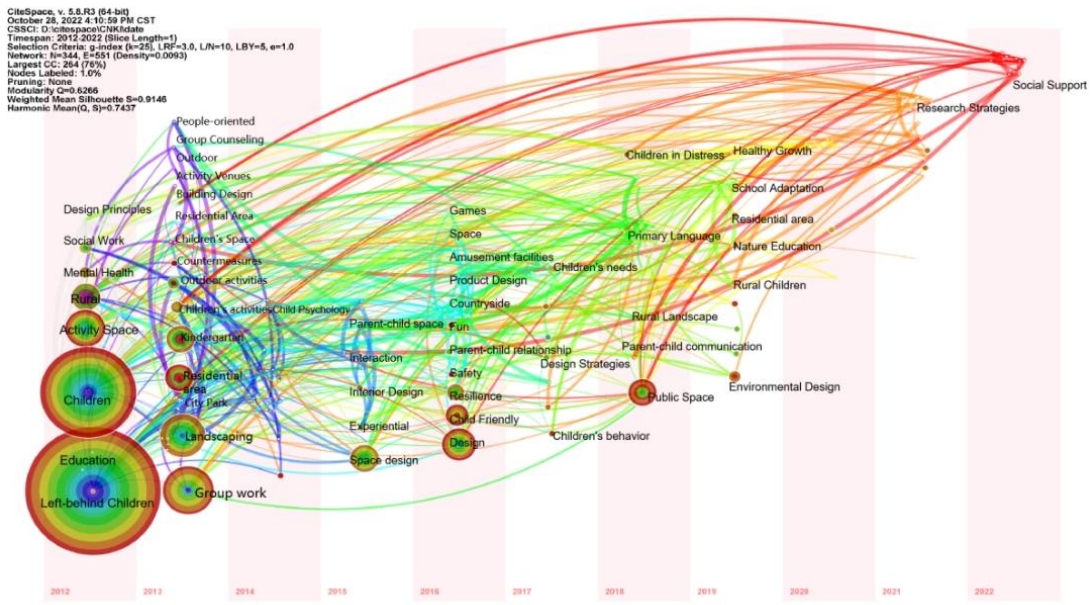


Figure 30 Time zone distribution of keywords

Source: Produced by the author from CiteSpace, 2022

The keyword mapping was plotted by time zone, and a time series analysis of the keywords was conducted, with the study spanning 2012–2022, resulting in a keyword time zone map. Figure 30 shows that the number of publications related to the study of activity space design for left-behind children is gradually increasing. Their healthy growth is related to revitalizing rural talents, culture, and industry. Research on left-behind children's living environment and activity space will continue to increase and deepen.

Combining Figure 29 and Figure 30, the development trajectory, duration cycle, and distribution characteristics of the research hotspots at different stages can be reflected. From 2012 to the present, the focus of attention is different in different periods, this is mostly influenced by the diverse needs of children who are left behind for living quarters at various periods. The study on this topic may be separated into three stages by assessing the high-frequency keywords in each time series: stage 1 from 2012–2015, stage 2 from 2016–2018, and stage 3 from 2019–2022. This also coincides with the analysis of the number of articles issued, and is more indicative of the changing thematic structure of the research on the design of activity spaces for left-behind children in these three phases.

Phase 1 (2012–2015) This phase mainly studies left-behind children, education, children, activity space, rural areas, mental health, social work, landscape or residential area design, and group work. The main research concepts in this period have been highlighted; researchers have begun paying attention to the living environment of left-behind children and investigating the demands of responding to left-behind children.

Phase 2 (2016–2018) In this stage, the focus is on design, child-friendliness, child behavior, public space, parent-child relationships, and the emergence of children's needs, it may be observed in the emphasis on the living environment of left-behind children while considering the psychological requirements of kids.

Phase 3 (2019–2022) In this stage, public space, parent-child communication, environmental design, nature education, research strategies, and social support emerge. Scholars have focused on integrating parent-child relationships into different life and learning activity scenarios. From 2019 until the present, investigate how to develop a solid and comprehensive care system for left-behind children and then design a focused activity space.

2.5.4 Conclusion

First, from the current volume of research literature on the design of activity spaces for children who are left behind, the total number of articles has been gradually increasing since 2015, reaching a peak in 2019, indicating that research in this field has steadily received attention.

Secondly, regarding research objects, most experts and scholars have researched rural left-behind children from an educational perspective, covering sociology, education, psychology, and other theoretical levels. They have conducted many surveys and studies and obtained more comprehensive data. However, the research on the indoor and outdoor spatial environment issues of left-behind children's lives is only sporadic, more attention and research are needed, and only a small group of professionals and researchers began concentrating on the living space environment of left-behind children in 2018, lacking traditional institutions to organize experts to conduct systematic research. Future studies on left-behind children's living environment and space must be expanded and deepened.

Third, regarding research institutions, it can be shown that the crucial research hotspots on social support for left-behind children's activity space design in China are not concentrated enough, based on a study of high-frequency words "left-behind children" and "design" in China. It is vital to develop a collaboration between authors and critical research institutes on this subject to effectively promote research on social assistance for children left behind in China, fully utilize the wisdom of each, break the academic barriers, and make more people pay attention to the issue of social support for children left behind in China.

Fourth, regarding research content, "left-behind children" was a high-frequency keyword in 2011. In the keyword cluster analysis, "left-behind children," "design," and "family structure" are all large clusters. This indicates that family structure is the central hot spot and direction of future research on designing activity spaces for left-behind children. It also influences the factors of space design. In rural revitalization, in terms of aim, it is beneficial for researchers to investigate how to strengthen social assistance for left-behind children successfully. subjective, and social support utilization and help them establish a sound mental health support system.

To sum up, this study only retrieved the full-text data of CIKN Chinese journals, and the research in this field in English and foreign research developments should have been covered. However, it intuitively showed the current situation, hot spots, and research trends in this field in China.

2.6 Summary

The literature review provides a solid theoretical basis and practical experience for designing activity centers for left-behind children in Hunan. A thorough grasp of the requirements and situations of children left behind was established through study in numerous areas, including the concept of left-behind children, child psychology, pedagogy, activity center design, and locality.

The researcher found that the literature review also highlighted challenges in the field of activity center design for left-behind children, including balancing different needs and incorporating locality. Future research and practice will need to delve further into these concerns and propose novel and practical design solutions to address the holistic development needs of at-risk children.

Chapter 3 Research Methodology

After the preliminary research in Chapter 2, this chapter focuses on the methodology. It mainly explains the research information, methods, steps of using research methods, and tools from researching information to understanding design requirements, including designing and researching results obtained from design, steps, and tools for creation. The study's methodology attempts to identify the significant parameters influencing the design of activity centers for left-behind children in rural regions. The following six sections are included:

Part 01: Introduction to the subjects involved in the study

Part 02: Study content

Part 03: Research tools

Part 04: Research steps

Part 05: How to collect data

Part 06: Data Analysis Methods and Tools

3.1 Introduction to the Subjects Involved in the Study

3.1.1 Summary of Experts

The dissertation expert committee comprises seven experts with professional knowledge and practical experience in architectural design, environmental design, child psychology, sociology, social workers, and regional cultural studies. The experts involved in the study can provide valuable suggestions and opinions in the professional discussion of the thesis research, questionnaire tool review and decision-making, design research, and design solutions to help the researcher better understand and solve the problem.

3.1.2 Target Audience

Left-behind children in rural areas aged 6–13 years old.

According to the research, the age pattern is consistent throughout Chinese provinces, with 21.7% of left-behind children aged 0-5, 67.3% aged 6-13, and 10.9% aged 14-16 (Statistics, 2023). Thus, the proportion of rural left-behind children aged 6-13 in China is greater than 50% (Figure 31).

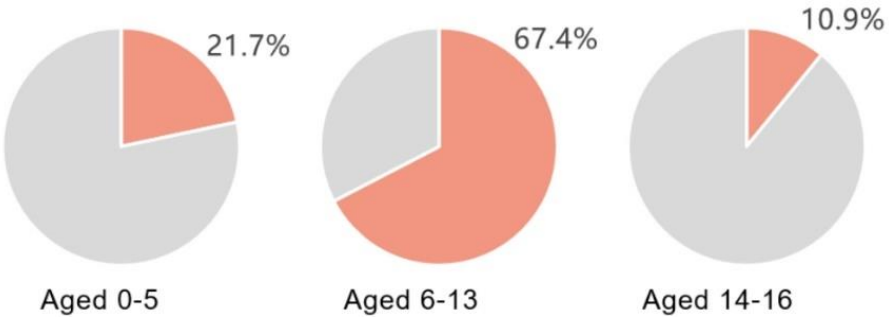


Figure 31 The proportion of the total amount of left-behind children (2020—2022)

Source: Government document: "China's Child Population in 2020: Facts and Figures", 2023

Children aged 6-13 are in the stage of comprehensive development of their physical functions, with specific independent ability, social ability, and ability of independent choice, which is a critical period for a personality formation.

3.1.3 Sample Size for Doing the Experiment

A questionnaire study of left-behind students from five rural elementary schools in Changde, Hunan Province, was conducted, and their related personnel, the researcher collected relevant data about the family situation, living habits, education, and activity needs of left-behind children. This data was critical in constructing an activity center for children left behind. The number of left-behind children tallied in five elementary schools reached 350; hence, the total amount of surveys handed to left-behind children was 350 (Table 7).

Table 7 Table of samples participating in the study and effective sample size

Sample Type	Object	Number of samples	Valid samples
User Needs Survey	Children	350	330
	Parents	195	189
	Teachers	46	45
Satisfaction Assessment	Experts	7	7
	Children	165	155
Total			726

3.2 Research Content

3.2.1 Research Hypothesis

Building a regional activity center for left-behind children in rural Hunan can better satisfy their requirements and boost their physical and mental health.

3.2.2 Research Objectives

To suggest a novel system and approach for addressing the issue of rural left-behind children in Hunan Province. That is, to create a decent exercise and social environment for them through regional activity centers to boost their physical and mental health and overall development.

3.3 Research Tools

The tools researchers use in their dissertation research are:

(1) Quantitative tools: literature research, questionnaire, statistical analysis

(2) Qualitative research tools: fieldwork, case studies, practice argument, expert evaluation

3.3.1 Literature Research

Through authoritative platforms such as "CNKI" and "WOS," we collected and reviewed relevant theoretical works, academic papers, professional journals, public media reports, and other online textual information with keywords such as rural left-behind children, children's activity space design, and left-behind children's behavior and psychology. In the past few years, we have summarized relevant research, research methodologies and tactics, and actual difficulties at home and abroad. The CiteSpace literature analysis approach is utilized to comprehend the research lineage and history of this research subject and the present development status, research hotspots, and future development patterns that will determine which research topics will erupt. Finally, develop a solid argument to back up your premise.

3.3.2 Fieldwork

This study has two main ways of observation and interview to collect primary data from four villages. Field understanding of the rural environment, the space for rural children's activities, the needs and expectations of left-behind children, parents, and township staff for constructing activity centers, and getting various information needed for this study.

3.3.3 Questionnaire

The questionnaire method is this paper's core and primary research method to obtain a larger sample of the regular activity situation of left-behind children. Field research, questionnaires, and records were used to obtain the information needed for the study. Questionnaires were designed to survey rural left-behind children, parents, with instructors at five elementary schools to better grasp the basic living realities of rural disadvantaged children, their preferences for outdoor activity levels, and their awareness of and needs for activity centers.

3.3.4 Case Study

Through the comparative analysis of domestic and foreign cases of children's welfare buildings, we sort out the commonalities and characteristics of the various programs, find and summarize the laws of standard design in all the materials, and summarize the design principles.

3.3.5 Statistical Analysis

Using the statistical analysis method, SPSS regression analysis was conducted on the valid questionnaires of children's papers. The statistical analysis was utilized to evaluate and assess left-behind children's daily activities, satisfaction with the activity space, and preferences for the activity space. and the characteristics and design strategies of the activity center for left-behind children.

3.3.6 Practice Argument

According to the design method proposed in this study, practice is used as a solid basis for argumentation, and the combination of theory and practice is sought. In this study, the design scheme of the children's activity center in Qinglin Town will be used as an example to analyze the design method proposed in the study in practice.

3.3.7 Expert Interview and Evaluation

Expert interviews were conducted and discussed mainly through face-to-face and web conferencing. The content and design practices of the questionnaire were first described. Then the experts suggested optimization based on the design practices and expertise required for the phase study.

3.3.8 Creating Tools for Research

The researcher followed the following steps to create the expert evaluation system used in the study:

(1) Research theoretical literature, books, and design-related studies.

(2) Study how to construct the research instrument.

(3) Setting up an expert evaluation system.

(4) Implement the survey instrument created to evaluate the design.

(5) Invite seven qualified experts to score design practices.

Seven experts in different fields were invited by invitation to score the researchers' design practices, identify strengths, weaknesses and shortcomings in the evaluation, and propose improvement programs and recommendations.

(6) Consistency analysis was conducted and academic committees and experts were selected for questionnaire terminology revision.

3.4 Research Steps

The research ideas act on each aspect of the overall research, respectively, after the data and needs obtained after the research for design research, through expert evaluation to verify the design, the final research to determine the research methodology for the left-behind children space, and the specific process and relationship (Figure 32).

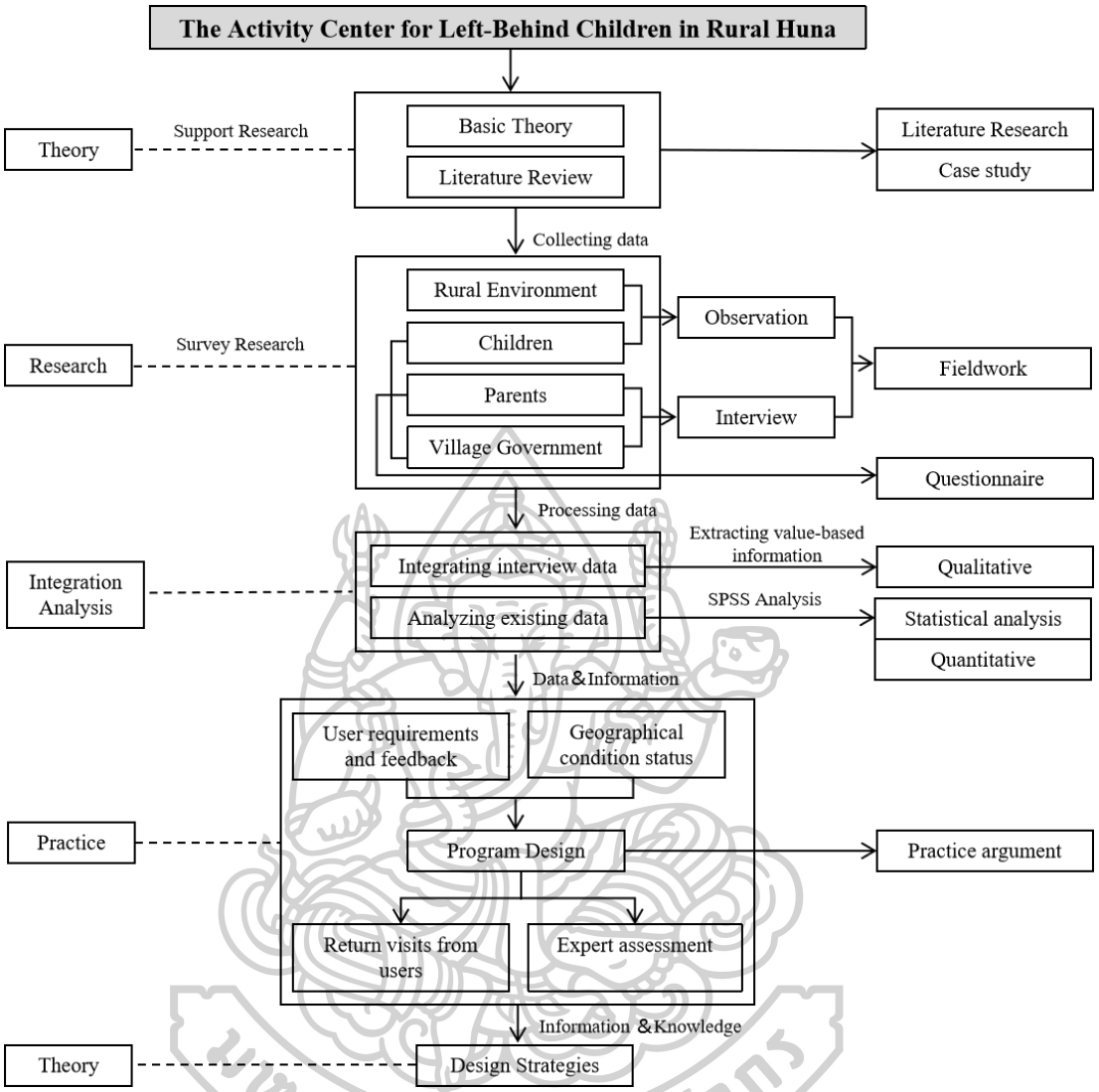


Figure 32 Flow chart of research methodology

Source: Self-drawn by the author, 2022

3.4.1 Study Design Information

(1) To research information regarding children who have been left in rural regions.

(2) To investigate the information about the connotation and value of Hunan's rural, regional culture.

(3) In the design of left-behind children's activity centers, the link between left-behind children, environment, and space will be investigated.

3.4.2 Design Steps

3.4.2.1 Combining the needs and problems of left-behind children and parents, and moreover the local socio-economic environment and cultural background, design an architectural design that meets the actual needs, including architectural style, spatial layout, functional partitioning, interior decoration, and other aspects.

3.4.2.2 Let experts assess the feasibility of the design plan, including site selection, architectural planning, space design, and material selection.

The evaluation experts were divided into design and Social Sciences, Children's Education, and Others (Table 8).

Table 8 List of experts

	Number	Name	Unit	Research Direction
1. Design	1	Professor. YuChen Gao	Shenyang Aerospace University, School of Design & Arts	Environmental Design Specialist
	2	Professor. Jianhong Chen	Guangzhou academy of fine arts	The Theory of Arts Scholarship/Regional Cultural Studies
	3	Professor. Min Wang	Guangzhou academy of fine arts	Design
	4	Professor. Liu Wei	Hunan Normal University	Architectural Design Specialist
2. Social Sciences, Children's Education, Others	5	Associate Professor. Qun Mo,	Hunan College for Preschool Education	Education Specialist: Child Psychology / Child Education
	6	Ya-Chun Yu	Changde City Women and Children's Federation	Child Protection Specialist
	7	Secretary of Qinglin Township. Shuangquan Liu	Qinglin Township People's Government	Social Work Specialist

3.4.2.3 Collect feedback from experts and continuously optimize the improvement plan.

3.4.2.4 Present and summarize the research results, as well as make suggestions and outlooks on the shortcomings of the research and future development.

3.5 How to Collect Data

The following steps were used to collect the data used in this study.

3.5.1 Request a copy of the research report from the University of the Arts Thailand to provide the panel with research information to check the accuracy of content and language.

3.5.2 Liaise with qualified experts who have been invited to identify to assess the consistency of the examination.

3.5.3 Collect the questionnaire information from the Expert Group for analysis and revision based on the recommendations.

3.5.4 Conducting Questionnaires and data collection.

(1) The questionnaire was designed for three groups: left-behind children, parents, and village administrators, and can be found in the Appendix. The questionnaire was designed to learn about the basic activities of rural left-behind children, their happiness with the present activity space environment, and their ideal environment.

(2) Rural left-behind children's impression of activity space has absolute reference value as the primary user group. Therefore, data recovery and questionnaire analysis, mainly using children's paper questionnaires for statistical analysis, are necessary to determine the specific needs of children. It helps to analyze and summarize the data and specify the design strategy.

3.6 Data Analysis Methods and Tools

3.6.1 Checking the Completeness of Each Questionnaire

3.6.2 Using the SPSS

The linear connection between the dependent variable and one or more independent variables may be studied using linear regression analysis. The researcher utilized SPSS to conduct linear regression analysis on the survey data to investigate the impact of several independent factors on the dependent variable, satisfaction with the activity space environment of rural left-behind children.

The steps of the analysis are as follows:

(1) Import the data and perform cleaning and pre-processing.

(2) Determine the dependent and independent variables.

Dependent variable: the activity space environment satisfaction score for rural left-behind children.

Independent variables: overall activity space satisfaction in rural areas, outdoor activity space satisfaction in rural areas, campus space environment satisfaction, and family space environment satisfaction.

(3) A standardization of variables was performed.

Since different independent variables may have different units of measurement, it is necessary to standardize all independent variables to ensure that they are comparable.

(4) Conduct linear regression analysis.

Using the linear regression analysis function in SPSS, the dependent and independent variables are entered into the model and fitted.

(5) Interpret the findings and test the model.

Among the findings of the investigation are the crucial indicators listed below.

The regression coefficient reflects the linear connection between the independent and dependent variables.

Significance level: indicates whether the independent variable's explanatory power on the dependent variable is statistically significant.

Coefficient of determination R2: reflects the magnitude of the explanatory strength of the independent variable on the dependent variable.

Finally, the analysis findings are checked and interpreted. Assume the study results show a substantial linear connection between the independent and dependent variables. For this case, the model can be used to predict the satisfaction score of the activity space environment for left-behind children. Also, cross-validation of the model is needed to ensure that it can accurately predict future data.

3.6.3 Likert Scales are Typically Used

(1) Design scale: According to the design plan, a questionnaire was designed about the design plan, including architectural style, space layout, functional partitioning, interior decoration, and other aspects. A Likert scale was used in the questionnaire, and respondents were asked to select the appropriate level according to their own opinions and views, such as "strongly agree," "agree," "unsure," "disagree," "strongly disagree."

(2) Sample selection: To guarantee the representativeness and reliability of the sample, a specified number of left-behind children and parents were chosen as the survey sample in the research region.

(3) Conducting a questionnaire survey: The sample was surveyed face-to-face, by telephone, and via the Internet to collect the respondents' opinions and attitudes towards the design program.

(4) Data processing and analysis: The collected data are summarized and processed, and statistical indicators such as each question's average score and standard deviation are calculated. The overall attitude and opinion of the respondents towards the architectural design scheme are determined through the data analysis.

(5) Result presentation: The analysis results will be presented, which can be done through tables, charts, and text descriptions, to show the respondents' attitudes and opinions on the architectural design solutions, compare the differences between different samples, and provide a reference for the optimization of the design solutions.

3.6.4 Summarize Findings and Conclusions

Based on the analysis results, the findings and conclusions are summarized, suggestions for improvement and optimization of the architectural design scheme are made, and the final design for improving the activity center for left-behind children is carried out.

Chapter 4 Research Results

Research on the design of a regional activity center for rural left-behind children in Hunan Province originates from design, sociology, and education research to address the psychological requirements of children.

Researchers obtain data from a large number of case studies and literature reviews. Fieldwork and questionnaire methods are critical research paths to gather information from different perspectives. Interviews with experts in the field helped to clarify redundant and invalid information. Valid questionnaires for the left-behind children were recovered through SPSS statistical calculations to identify critical factors. The final information obtained will be used to design the work and evaluate the feedback.

The researcher analyzed and summarized the design and studied the design results from user and expert evaluations. The details are as follows:

Part 01: Analyze the study data, summarize the results, and guide the design of experiments.

Part 02: Summarize the design methodology based on design experiments.

Part 03: Guide the design practice based on the design methodology.

Part 04: Analysis of activities that can be carried out in activity centers.

Part 05: The design solution shows the research results and the satisfaction of the target subjects.

Part 06: Summary.

4.1 Analysis of Study Data and Summary of Results

4.1.1 Literature Research and Research Analysis Results

A total of five sections based on literature research and literature analysis are summarized as follows (Table 9).

Table 9 Summary of literature studies

(1) Relevant Theoretical Foundations This section introduces the theoretical foundations covered by the literature review, such as Environmental Psychology, Psychology of child development, Cognitive development theory, Maslow's idea of the hierarchy of needs, and Regionality. These theories provide the basis for designing activity centers that enable them to meet better the needs and development of rural children who have been left behind.
(2) Theories and Concepts about Left-Behind Children in Rural Regions These concepts and theories serve as a guide and reference for the design of activity centers, allowing designers to understand rural left-behind children's requirements better.
(3) Concepts and Theories Related to the Design of Children's Activity Centers This section introduces the current status of activity centers for children, the impact on the growth of left-behind children, and relevant case studies. These concepts and theories provide practical guidance for designing activity centers.
(4) Concepts and Theories Related to the Hunan locality This section focuses on the characteristics and cultural background of the Hunan locality. These concepts and theories are essential for developing activity centers because they assist researchers in the region's social milieu and cultural backdrop, allowing them to create centers that better satisfy local demands.
(5) Quantitative Analysis Related Concepts and Theories The CiteSpace literature analysis method used in the study to understand the research lineage and development history of this research area, the current state of progress, research hotspots, future trends, and which research topics will burst. It provides reliable data support for the later study and helps to evaluate and improve the design of the activity center.

Through literature research, the main points that should be paid attention to when designing activity centers are obtained (Table10).

Table 10 Design guidelines derived from literature studies

Designing for needs	More attention needs to be paid to their needs when designing, including psychological, social and knowledge needs.
Introduce local cultural elements	Local cultural elements should be fully integrated to give children a better sense of their identity and cultural belonging.
Introduce gamification design	Incorporate game elements into the design to engage children's interest through the form of games. Gamification design can increase user engagement and motivation, thus better promoting their growth and development.
Adding an Emotional Experience	Designed to give them warmth and care and help them develop an optimistic emotional attitude.

4.1.2 Case Study Results

The design concepts of different nations for child welfare facilities are presented (Table 11) based on the literature analysis method.

Table 11 Design perspectives on child welfare buildings in different countries

Country	Targeted population	Design Features
China	Left-behind children's	Locality, an entertaining place.
Japan	Child	Multi-layered public spaces enhance social interaction.
America		Integration and interaction between children and the original environment
U. K		Building an experiential growth environment for children.
Australia		Focusing on nature education for children and exercising their sense of adventure
Germany		A fun, safe and natural experience. The site is culturally respectful of history and culture.

4.1.3 Fieldwork and Analysis of Results

4.1.3.1 Overview

This study adopts the field survey method, taking the villages of Hunan Province as the research site. Hunan Province is located in China's southeast hinterland and the middle stretch of the Yangtze River, bordering Hubei to the north, Jiangxi in the east, Guangdong and Guangxi in the south, and Chongqing and Guizhou in the west. The province has a land area of about 211,800km², accounting for 2.2% of China's land area and ranking 10th among all provinces and municipalities in the country in terms of area. It is named "Hunan" because it is south of Dongting Lake and "Xiang" because the largest river in the province, the Xiang River, runs through the north and south. Hunan's area is bordered by east, south, and west mountains, low throughout the center and north, eventually forming a horseshoe-shaped basin towards

the Jianghan Plain in the north (Figure 33). Hunan Province is primarily mountainous, with mountains comprising over half of the entire area of the province. In contrast, other types of terrain, such as plains, basins, hills, and water areas, cover less than 50% of the province's total area. In this research, the designer researched, summarized, and analyzed four rural villages to make a basis for selecting a suitable location as a central site for left-behind children in the village (Table 12).

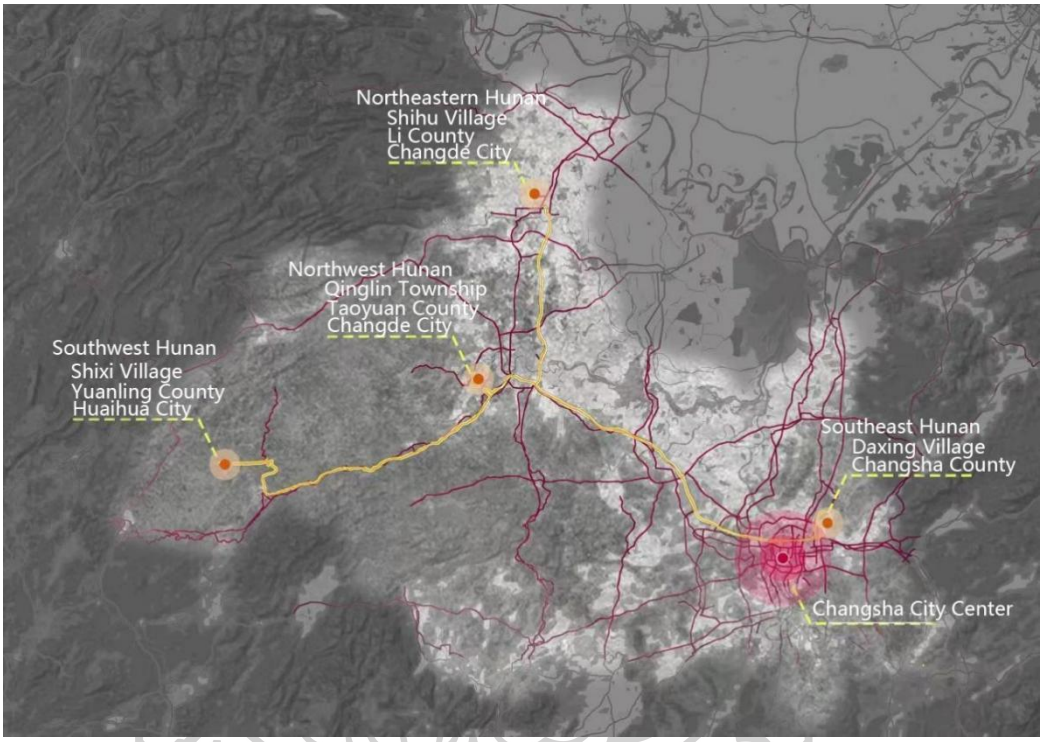


Figure 33 Diagram of the location of the research object

Source: Adapted by the author from Google Maps, 2022

(1) Daxing Village in Changsha County lies in the southeastern region of Hunan Province, approximately 35 kilometers from Changsha City's central core. It belongs to the village under the jurisdiction of Huanghua Town in Changsha County, which has a hilly and mountainous terrain.

(2) Changde Li County Shihu Village is located in Hunan Province's northeastern region, about 89 kilometers from the urban area of Changde City. It belongs to the territory of Li Yang Town, Li County, and Changde City, which has flat topography.

(3) Shixi Village in Yuanling County, Huaihua City, is located in the southwestern part of Hunan Province, about 170km away from the urban area of Huaihua City, and belongs to the community under the jurisdiction of Eryou Township, Yuanling County, Huaihua City, which is dominated by hills and mountains with relatively large topographic undulations.

(4) Changde Taoyuan Qinglin Township is located in the northwestern part of Hunan Province, about 35 kilometers from the urban area of Changde City. It is an administrative village under the jurisdiction of Qinglin Township of Taoyuan County, Changde City, which is mainly mountainous and has both hilly and plain topographic features.

Table 12 Basic information of four rural research samples in Hunan

Location	**County Name**	**Topography and landform**	**Distance from the city**
Southeast Hunan	Daxing Village	Hilly, mountainous area	About 35km from the urban area
Northeast Hunan	Shihu Village	Flat terrain	About 89km from the urban area
Southwest Hunan	Shixi Village	Hilly and mountainous terrain with relatively large undulations	About 170km from the urban area
Northwest Hunan	Qinglin Township	Mainly mountainous, with hilly and plain topography	About 35km from the urban area

4.1.3.2 Methodology and Process

(1) Observation method: Direct and indirect observations were used to grasp the psychological and behavioral conditions, living environment, activity sites, and other related issues of the research subjects and to familiarize and grasp the overall background of the research subjects.

(2) Unstructured interview: Interviews and communication with children's parents and village supporters. Learn more about the psychological and environmental requirements of rural left-behind children.

For the research process, see figure 34.

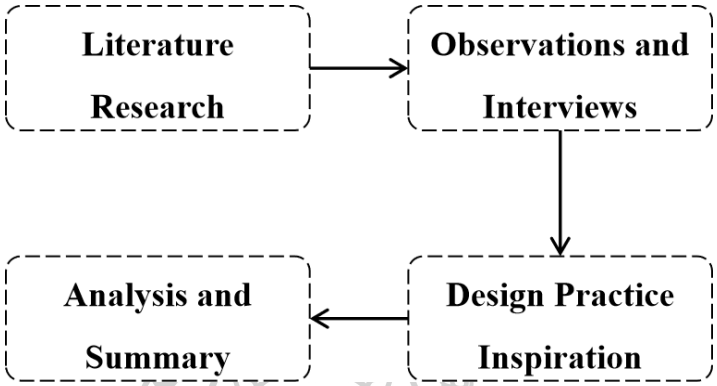


Figure 34 Research process

Source: Self-drawn by the author, 2022

4.1.3.3 Analysis of Results

(1) Observation Method

Non-interference behavior observation was employed in the field survey in this observation technique to focus on the activity features of the group of left-behind children and to record and extract aspects of spatial environmental concerns connected to children's activity area.

Individual observation:

The researcher took a left-behind child in rural areas as a specific object and observed her daily life trajectory (Figure 35). From getting up in the morning, they were going to school, going to class, playing, eating, lunch break, going to class, going home, eating, doing homework, sleeping, one day law of life. Moreover, photos and time records summarize the lack of left-behind children in their lives. This lifestyle will find the children's requirements in the design of the left-behind children's activity center.

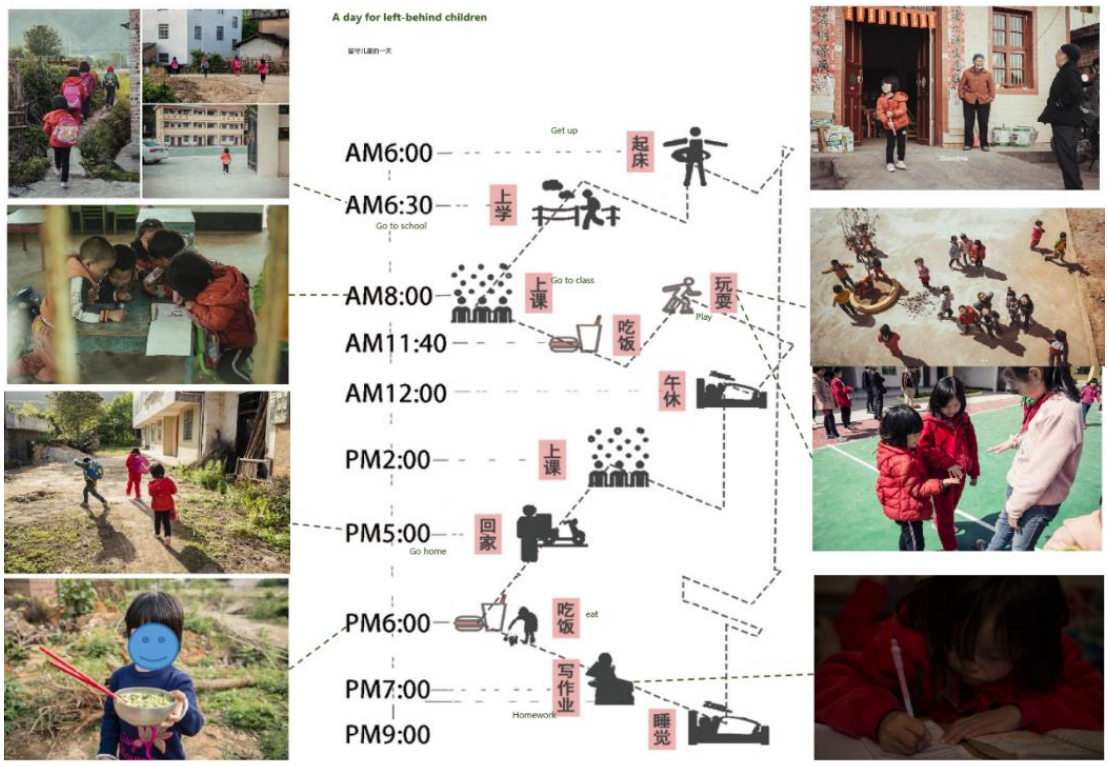


Figure 35 A Day for left-behind children

Source: Photo and drawn by author, 2022

Group observation:

Twenty left-behind children were selected from five villages in Hunan Province for field group observation. Please pay special attention to the conduct and activities of left-behind kids in rural regions; comprehend the basic life norms and activity features of left-behind kids aged 6 to 13, including information on activity time, activity type, activity space, and use of activity; and use Take photos, record them, summarize statistics, obtain the characteristics of their behavior and activities, and further understand their needs.

When recording, separate observations were made and recorded according to the school and vacation periods, and the data were recorded (Figure 36).

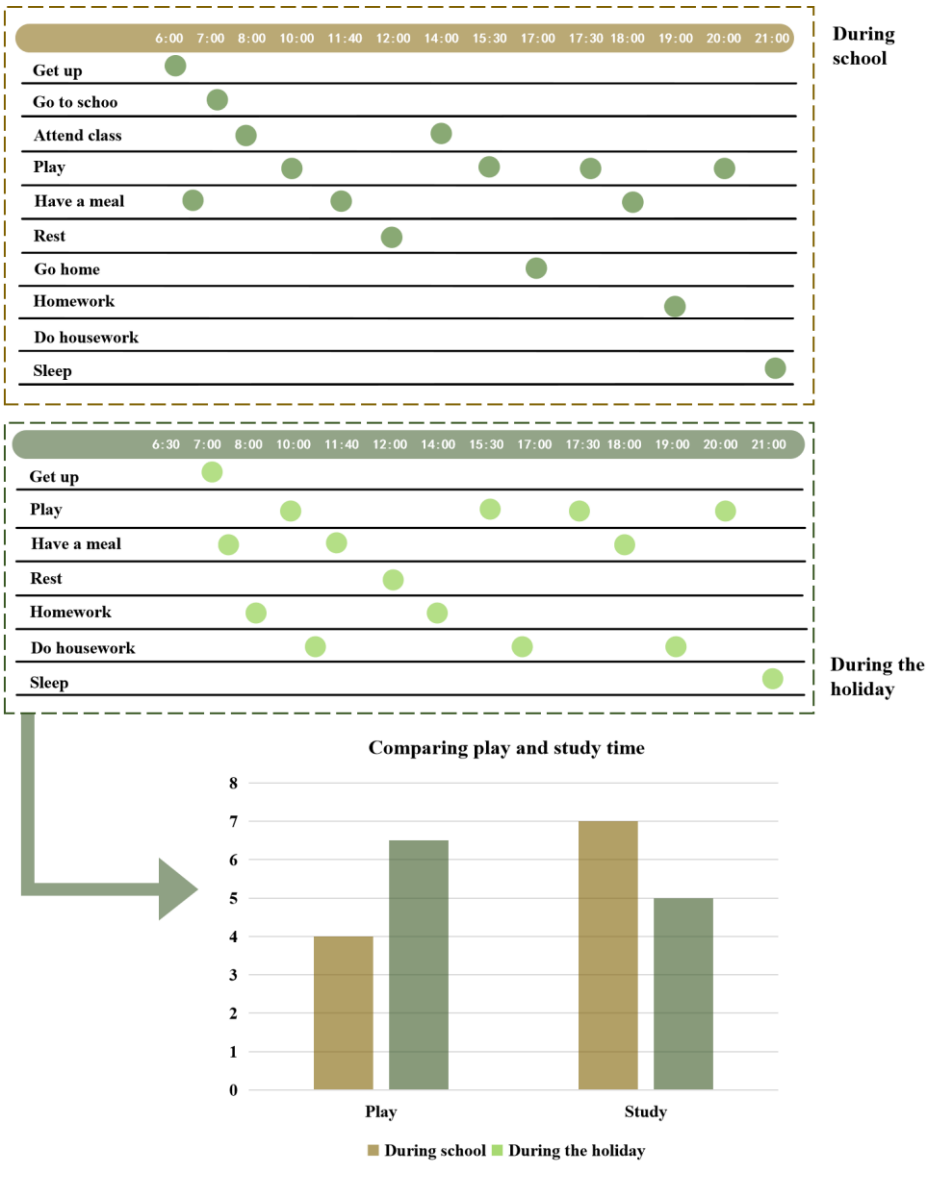


Figure 36 Comparing play and study time

Source: Self-drawn by the author, 2022

To understand the living patterns and key activity features of rural left-behind children aged 6-13 years, the behavior and activities of left-behind children were studied.

According to the information on activity time and type of activity, the researchers found that rural left-behind children spend 3–4 hours playing during school

and 5.5–6.5 hours playing during holidays. The study time during school is 6-7 hours, and the study time during holidays is 4-5.

Furthermore, most activity venues for left-behind children are school courts and schoolyards. There are few official activity places for children's and even fewer for left-behind children.

Rural environment observation:

During the on-site research, the researchers found that the number of young people within the villages is small, mostly older people and children, accounting for more than 90% of the population. Because most young and middle-aged individuals go for employment, older people and children in the village should be included. The research is summarized as follows in order to thoroughly grasp the current state of the rural environment, rural campus environment, and activity centers for left-behind children in Hunan cities, as well as to monitor the behavior and space use of left-behind children and their guardians:

About the Left-behind Children Activity Center: The researchers found that most of the activity spaces for left-behind children are set up in schools, ancestral halls, village committees, and other locations, and all children share these activity spaces; most of them lack independent activity spaces for left-behind children; and the activity spaces have a single function and a single form of activity (Figure 37).

Figure 37 Left-behind children activity center

Source: Photo by author, 2021

Rural Environmental Aspects: At present, the rural revitalization strategy implemented in China is an essential task of the policy for improving the rural living environment and building beautiful and livable villages. The infrastructure, village appearance, and human living environment in rural areas have been greatly improved. However, there needs to be more research on children's activity spaces in rural areas. Specific talks on the formal style, organizational structure, spatial layout, and activity patterns of various sorts of children's activity venues are still needed in the research. It lacks a theoretical framework for understanding the link between children's behavioral features and the objective environment of the places.

As a result, most of the activity spaces for rural children are unused open spaces in the village or recreational sites for the elderly. There is no separate space for children's activities, much less for those left behind (Figure 38).

Figure 38 Rural Environment

Source: Photo by author, 2021

Rural Campus Environment： Through the research, it was found that rural elementary school campuses in Hunan lacked a holistic concept in planning and design, with a vague campus environment and a single functional layout that could not meet the development of children's nature and insufficient understanding of the interaction between campus environmental space and the behavioral development of left-behind children (Figure 39).

Many campuses are one-sidedly focused on the current needs of school construction and the need for construction land and construction costs. They

must assess if the created campus can satisfy the demands of the campus community and whether it can adapt to the balanced growth of compulsory education while merely meeting the building needs based on current enrolment. The campus environment planning needs a developmental vision and holistic concept.

On the other hand, due to the trend of urbanization and the influx of the rural population to cities, the number of students in rural areas is getting smaller and smaller. In contrast, most classes in county and city schools are full, leading to an imbalance in student population, and rural schools face the dilemma of gradual shrinkage or even extinction.

Figure 39 Rural Campus Environment

Source: Photo by author, 2021

Among the five schools studied, those more remote have a simple infrastructure and an average teaching environment. The schools closer to the city had relatively better infrastructure. Rural elementary schools have only sports spaces, such as courts and playgrounds. Children's activity spaces are relatively homogeneous, with less space for activities than in urban schools and even less space for left-behind children alone.

(2) Interview Method

Unstructured interviews with children's parents: The purpose is to obtain the content and typical characteristics of children's activities from the caregiver's perspective, to extract the elements of the spatial environment that may have an impact on children or that they focus on, to identify existing problems, as well as to better grasp the link between children and their surroundings. Parents are the most crucial and direct intervention group for children's activities, and they also know the most about their children's needs and traits. In the meanwhile, in caring for children, they are in the best position to appreciate the various elements of the environment that are closely related to children and identify existing deficiencies. Conducting in-depth interviews with parents is a critical way to obtain first-hand information.

Unstructured interviews with village branch secretaries and township secretaries: The goal was to comprehend primary data on left-behind children in rural areas, as well as the current state of care services for left-behind children in rural areas, from the standpoint of government support and concern and to obtain national and governmental policies and measures for the establishment of a care and protection system for left-behind children (Figure 40).

The keyword shorthand was used to conduct the interviews. The text was summarized at the end of the interviews to distill the elements of the spatial environment that might impact children's activities or childcare behavior and summarize the main existing problems. The interview approach gives an in-depth insight into the guardians of rural left-behind children and other vital facts that the other methods cannot convey, providing strong support for this study.

Figure 40 Unstructured interviews with children's parents, village clerks, and township clerks

Source: Photo taken by the research team, 2021

Summary of unstructured interviews.

Parent interviews: Most rural left-behind children are under the proxy care of their grandparents, according to the parents questioned. The proxy guardians lack the academic ability and do not know the scientific methods of caring for their children; some even tend to spoil their children. Some children resent that their parents are not always with them and resist their parents' teachings. Many parents also know that accompanying their children is the best care, so they bring their children around before school age and send them to school in their hometowns when they are old enough to attend school because of the difficulty of attending school at the work site. However, they only send them to live together at the work site in the summer. Before the problem of migrant children moving to school with them is solved, asking parents to do their duty and responsibility is complex.

Moreover, most migrant workers are not highly educated, and the lack of ways and means of family education also restricts their due diligence. Because of long-term parental separation, a lack of parent-child bonding, and a significant lack of parental care and supervision, and the inability to seek help from parents in a time when they encounter problems and difficulties, some left-behind children are physically and

mentally anxious and prone to abnormal behaviors such as isolation and exclusion, impulsiveness and aggressiveness, rebellion, and capriciousness.

Interviews with village administrators: The township governments and village committees reflected that implementing rural revitalization, economic development, and poverty alleviation are the top priorities of local governments, and the government's focus is primarily on economic construction. Simultaneously, more emphasis should be placed on caring for children left behind. The care work of county and township people's governments needs more operable initiatives except for material assistance, and the supervision and guidance functions of civil affairs and other related departments are rarely reflected. The authority and duties of various government agencies are generally dispersed and poorly articulated, resulting in the labor of caring for left-behind children staying at the level of official paperwork, the CCF's appeal, and so on, education support, and civil affairs assistance, which does not meet the spiritual care needs of left-behind children and fails to take adequate measures to guide social forces to give spiritual care to left-behind children. as a result, the Communist Youth League, Women's Federation, trade unions and other social organizations, as well as other social forces, offer love and condolences are one-time economic donations, and the actual effect of care activities is not ideal.

The following valid information was summarized through interviews with parents and village managers:

1) Difficulties faced: According to current situation research, the most prominent challenge experienced by left-behind children in villages is a lack of affection, accounting for 91.32% of the total, followed by the backwardness of education facilities, accounting for 80.35%, these two issues are also the most serious issues confronting left-behind children in communities. The remaining issues include the necessity for economic income and personal safety, the inadequacy of activity venue building, and a shortage of medical resources (Figure 41).

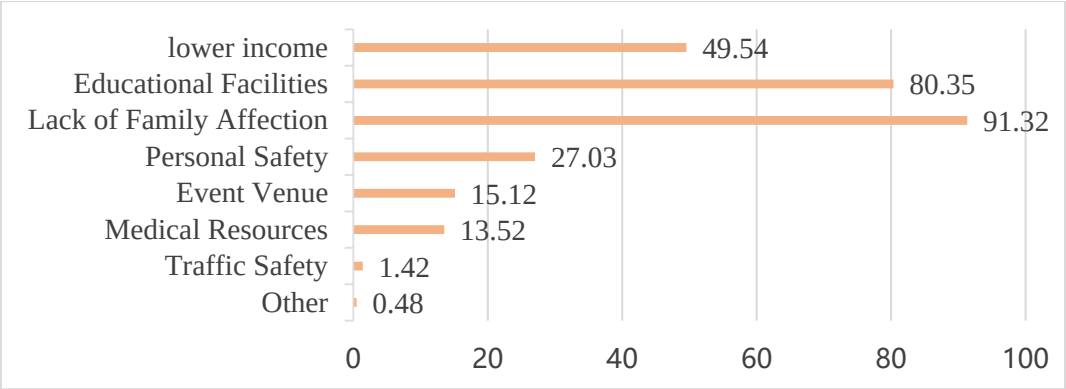


Figure 41 Difficulties faced by left-behind children in villages

Source: Self-drawn by the author, 2022

2) Psychological difficulties of left-behind children in rural locations and solutions: According to the cross-analysis, understanding the psychological condition of left-behind children is crucial for studying the design of activity centers for left-behind children in rural regions. Data show that the issues created by inferiority complexes and an absence of affection among left-behind children are relatively severe. The psychological treatment methods for this group are mainly painting, music, sand tray games, picture exchange communication, and ground games. Cognitive-behavioral, gardening, drama, and sensory integration training are less used (Figure 42).

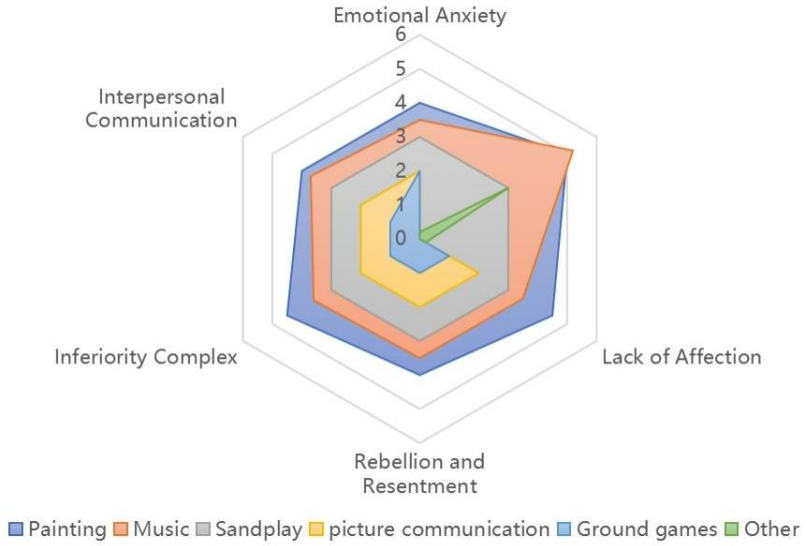


Figure 42 Psychological problems and treatment methods

Source: Self-drawn by the author, 2022

3) Existing problems with playgrounds for rural children: 70.92% feel that there aren't enough specialized outdoor playgrounds for kids; 77.5% believe that there is a lack of various interesting game; 67.53% believe that there is a lack of spacious and safe activity areas; 45.33% believe that there is a lack of use of natural resources; and 42.5% believe that there is a lack of places for guardians to rest and talk. 42.5% thought there needed to be more places for guardians to rest and talk. The above results show that the construction of activity areas for rural children still needs to be continuously developed (Figure 43).

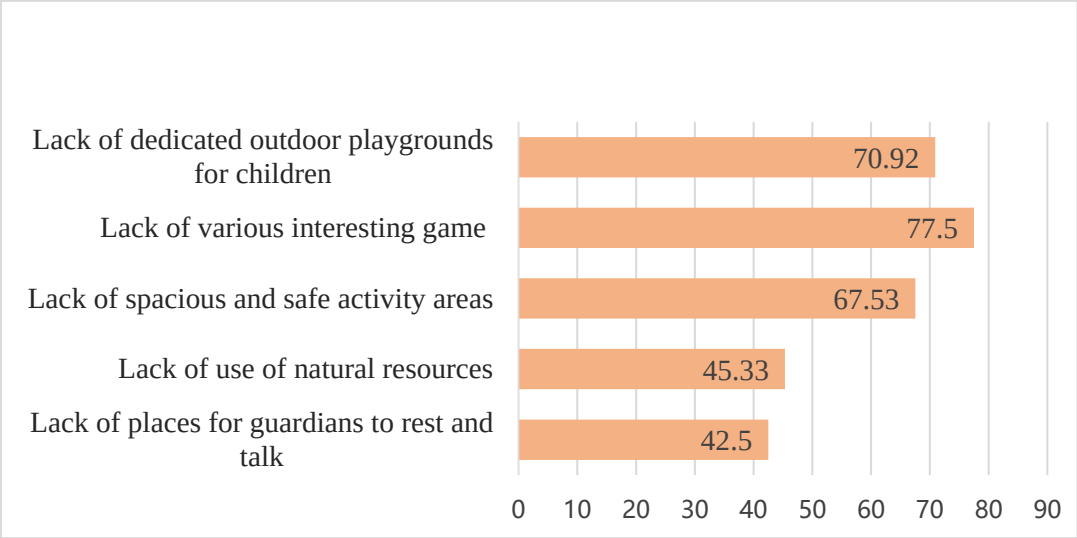


Figure 43 Existing Problems with children's venue

Source: Self-drawn by the author, 2022

4) Ways of giving help to rural left-behind children: From the interviews with the township managers, we know that the community helps rural left-behind children in many ways. There are many ways to help rural children in the short term, and there are many ways for people to help them and contribute to their efforts. One of the more common ways is to make donations through mobile APP, followed by donations to charities and voluntary teaching services in villages. A few people choose to help by investing in village planning and construction and providing regular and straightforward companionship (Figure 44).

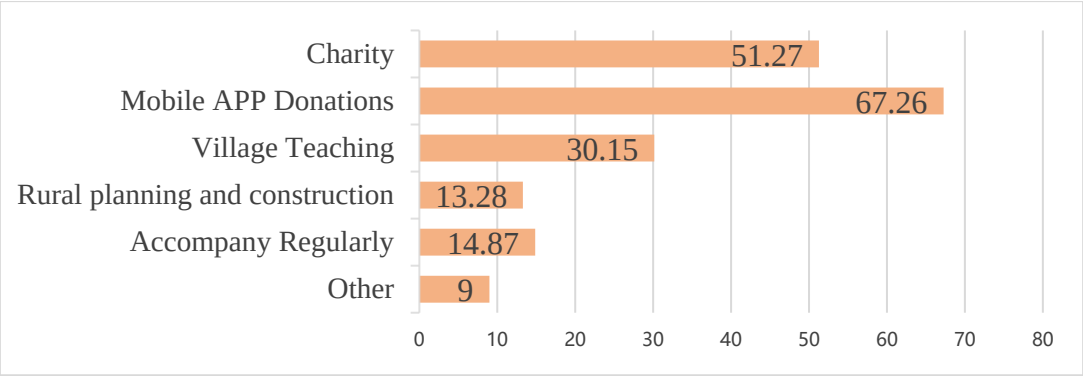


Figure 44 Ways to give help to left-behind children

Source: Self-drawn by the author, 2022

5) The necessity of building activity centers for rural left-behind children: 99.18% of people think that rural left-behind children need a playground, while only 0.82% think that children should focus on learning rather than playing (Figure 45). The above data shows that constructing a rehabilitation playground for rural left-behind children enhances their mental and physical growth.

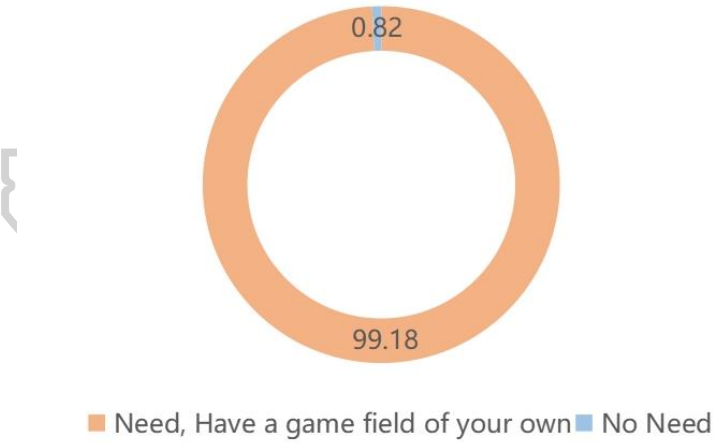


Figure 45 The need to build a center for children left behind in villages

Source: Self-drawn by the author, 2022

Among the four villages interviewed, the village committees of two villages have built activity centers for left-behind children, with essential functions such as reading and reading rooms, music rooms, and painting rooms, which are open to children and teenagers, providing a perfect place for extracurricular learning and activities for left-behind children. However, the functions of the music and painting

rooms have yet to be brought into play due to the lack of relevant professional guidance. The fieldwork led to the following summary:

1) The number of children left behind is significant; there are problems in education and psychology， and activity centers must be established to solve these problems.

2) The left-behind children are mainly of 6-13 age, and need to design some educational and recreational activities suitable for their age.

3) Parents and township staff of left-behind children are very concerned about the construction and management of the activity center, and they hope that the activity center can provide useful services and help, and they also need to ensure safety and orderly management.

4) The construction of activity centers needs to consider the actual local situation and resource status, such as space, facilities, and manpower.

5) The design of the activity center needs to focus on the needs and opinions of the children, as well as the opinions of parents and township staff, to build an activity center that can meet the needs of multiple parties.

4.1.4 Questionnaire Survey and Result Analysis

4.1.4.1 Overview

The questionnaire survey method is based on the field survey, through the design of questionnaires for rural left-behind children to conduct random surveys to obtain a larger sample of left-behind children's behavioral activities. The questionnaire mainly focuses on the living conditions of rural left-behind children and their awareness. It needs behavioral activity environments to learn about their behavioral activities, further understand their needs, and provide a basis for the later stage.

4.1.4.2 Methodology and Process

The research sample was selected based on the conditions available to the researcher on top of the most suitable address; the location is five elementary schools in 4 locations in Changde City, Hunan Province; the basic situation of the research site selection (Table 13).

Table 13 Five elementary schools surveyed by questionnaire

School	Villages	Number of Releases	Quantity Recovered	Valid Questionnaires
Wangjiashou Primary School	Taoyuan County Qinglin	60	55	55
Dongzhou Primary School	Xizhou Township, Xihu Management Zone, Wangshou Village	65	60	60
Xiajiao Primary School	Xihu Management District Xizhou Township	70	65	65
Xinmin Primary School	Chongquan Village, Chilhe Township, Taoyuan County	82	80	80
Pingdong Primary School	Pingdong Village, Hubishan Township, Shimen County, Hunan Province	73	70	70
Total		350	330	330

The researchers chose Wang Jiarong Primary School, Xia Jiao Primary School, Xinmin Primary School, and Pingdong Primary School as the research samples. They conducted a questionnaire survey to understand better the genuine demands of left-behind children and related people for activity space. Most of the pupils at the five primary schools, all rural elementary schools located far from cities and towns, are left-behind kids. Preschoolers' lower cognitive level was eliminated from the study's scope to increase the sample's efficacy. Three hundred fifty questionnaires were distributed, and 330 were successfully recovered, with a recovery percentage of 94.28%: activity space, satisfaction with the activity space, and intention of activity center design.

This study aims to understand children's satisfaction with the rural environment, their desire for rural activity spaces, their choice of activity spaces, and their intention to design activity centers.

4.1.4.3 Analysis of Results

(1) Analysis of the Returned Data from Children's Questionnaires

This study uses a linear regression model to evaluate the data. It quantitatively investigates the relationship between demand parameters and the activity space for children who are left behind.

The researchers already know that the everyday routines of the children left behind in rural areas involve playing with their phones, hanging out with friends, performing chores around the house, studying, and other things. Among them, 83.33 percent of the kids who were left behind played on their mobile phones, 49.16% played with friends, 42.5% cleaned their homes, 40% studied, and 3.33% engaged in other activities. It is clear from this collection of statistics that most of the children who were left behind are excessively reliant on electronic devices, which, to some extent, stunts children's ability to develop normally.

Children left behind were polled on their happiness with the activity room. According to the current state of China's rural areas, the outdoor environment, home environment, and campus environment make up the majority of they play spaces. Proportion of children dissatisfied with outdoor space (Figure 46). Delighted children account for 12.72%, satisfied children account for 21.82%, satisfied children generally account for 55.15%, dissatisfied children account for 8.18%, and very dissatisfied children generally account for 2.12%. The precise percentage of left-behind youngsters who are content with the campus space is 3.33% extremely satisfied, 45.76% satisfied, 17.57% usually unsatisfied, 2.42% dissatisfied, and 0.9% very dissatisfied the precise proportion of youngsters who were left behind who were satisfied with the campus space. Delighted customers make up 37.58% of the total; satisfied customers make up 45.76%; typically, 13.33%; customers who are dissatisfied make up 0.9%; and dissatisfied customers make up 2.42%. The study results show that left-behind youngsters have a generally favorable opinion of rural activity spaces, with campus spaces scoring higher and outdoor spaces scoring lower.

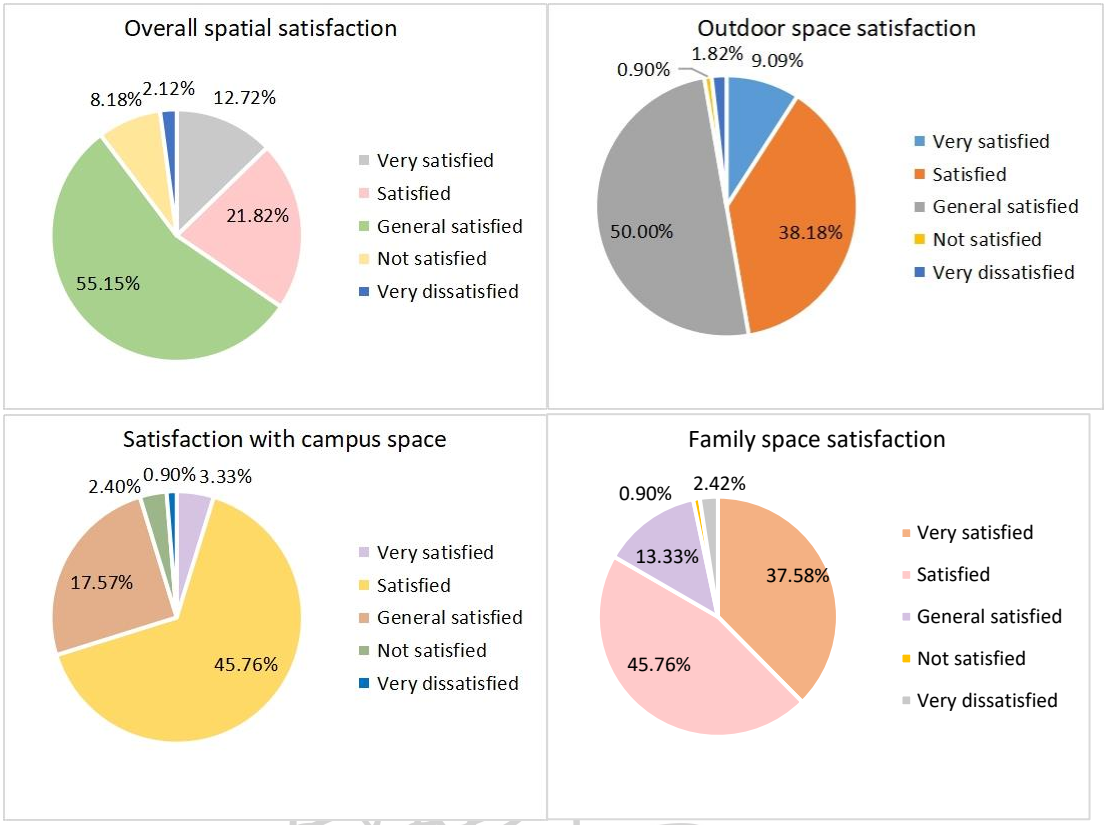


Figure 46 Environmental satisfaction results

Source: Self-drawn by the author, 2022

The study on children's preference for play space that is left behind. The research reveals that the natural environment, village street, school, and home belong to the children left behind. According to the survey results (Figure 47), 61.21% of left-behind children enjoy playing in village streets, 70% of left-behind children enjoy playing in natural spaces like fields, forests, and streams, 43.03% of left-behind children would like to participate in school activities, and 56.06% of left-behind children prefer to play on their mobile phones at home. The research demonstrates that some left-behind kids are eager to get out and meet friends, but the mobile phone network also impacts some of them, and they would rather stay in and play mobile games and watch short videos, which tends to stunt kids' development.

The youngsters who were left out of the survey on activity space expectations. According to the study, 50.91% of the left-behind children believed they needed to increase their social space, 43.33% wanted to improve their educational space, and only 35.15% thought they needed to improve their emotional space. 71% of the

left-behind children expected the improvement of the entertainment space (Figure 47). Left-behind children do not spend a lot of time interacting with their parents, so their need for emotional space is low. This indicates that the left-behind children's daily emotions come from their friends, teachers, and relatives and that by promoting other spaces, it is possible to compensate for the emotional certainty of the left-behind children partially and effectively support their healthy development.

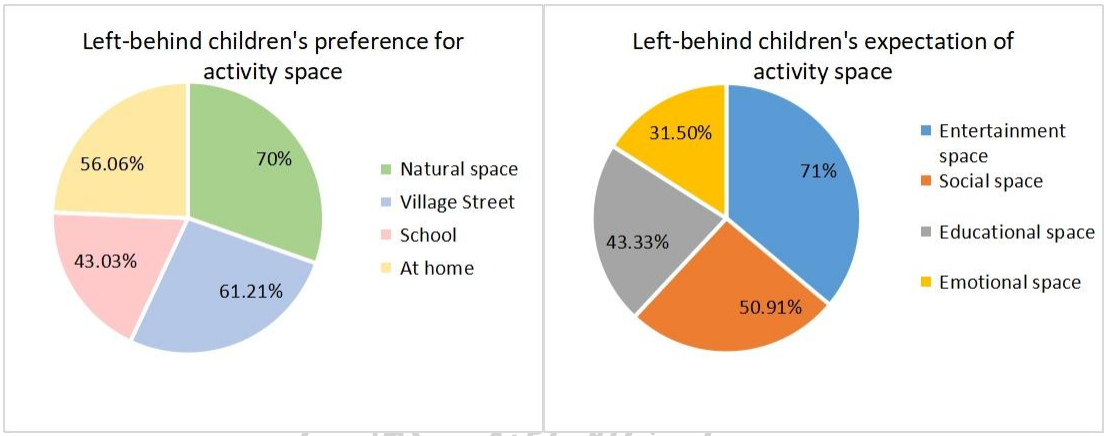


Figure 47 Analysis of the results of the event space survey

Source: Self-drawn by the author, 2022

SPSS software was used to assess the variables of activity space and overall happiness of left-behind youngsters. The correlation coefficient between the factors of activity space and the overall satisfaction of left-behind children was found (Table14).

Table 14 Results of the linear regression analysis (n=330)

	Non-standardized coefficients		Standardization coefficient	t	p	VIF
	B	Standard error	Beta			
Constant	-0.797	0.188	-	-4.245	0.000**	-
Outdoor space satisfaction	0.486	0.077	0.416	6.339	0.000**	2.910
Satisfaction with the living space	0.188	0.107	0.199	1.762	0.081	8.658
Campus environment satisfaction	0.402	0.135	0.366	2.976	0.004**	10.231
R 2	0.859					
AdjustR 2	0.855					
F	F (3,95) =193.410, p=0.000					
D-Wvalue	0.315					

Dependent variable: overall satisfaction

* p<0.05 ** p<0.01

That contentment with the outdoors, living quarters, and campus environment were included as independent variables (Table 14). In the regression analysis, overall satisfaction was employed as a dependent variable. The formula for the model is as follows:

Overall satisfaction is calculated as follows: Overall satisfaction = -0.797 + 0.486 * outdoor space satisfaction + 0.188 * residential space satisfaction + 0.402 * campus environment satisfaction. The Model R square value of 0.859 indicates that outdoor, living space, and campus environment satisfaction can account for 85.9% of the overall satisfaction.

The F test was passed by the model (F = 193.410, P = 0.000.05), indicating that contentment with residential conditions, outdoor spaces, and at least one feature of the campus environment all affect overall satisfaction.

This is the result of the analysis: The outdoor space satisfaction regression coefficient was 0.486(t = 6.339, p = 0.000 < 0.01), indicating that outside space contentment significantly improved overall satisfaction.

According to the regression coefficient 0.188, contentment with one's living quarters did not affect overall satisfaction ($t = 1.762$, $p = 0.081 > 0.05$).

According to the regression coefficient of 0.402, campus environment satisfaction has a significant positive influence on overall satisfaction ($t = 2.976$, $p = 0.004 < 0.01$).

Conclusion: The association between overall contentment and satisfaction with outdoor space and the campus environment would be significantly improved. However, overall contentment is unaffected by satisfaction with one's living arrangements.

(2) Analysis of the returned data from parental questionnaires

By analyzing the returned data from the questionnaire for parents of left-behind children, the researchers came to the following conclusions:

First, more than 80% of parents reported that their children had places near their homes where they could do outdoor activities, with 50% of them considering these places to be very suitable for children's activities, 30% considering them to be more suitable, and only 10% considering them to be less suitable. These results suggest that most families have relatively good outdoor areas for children to use (Figure 48).

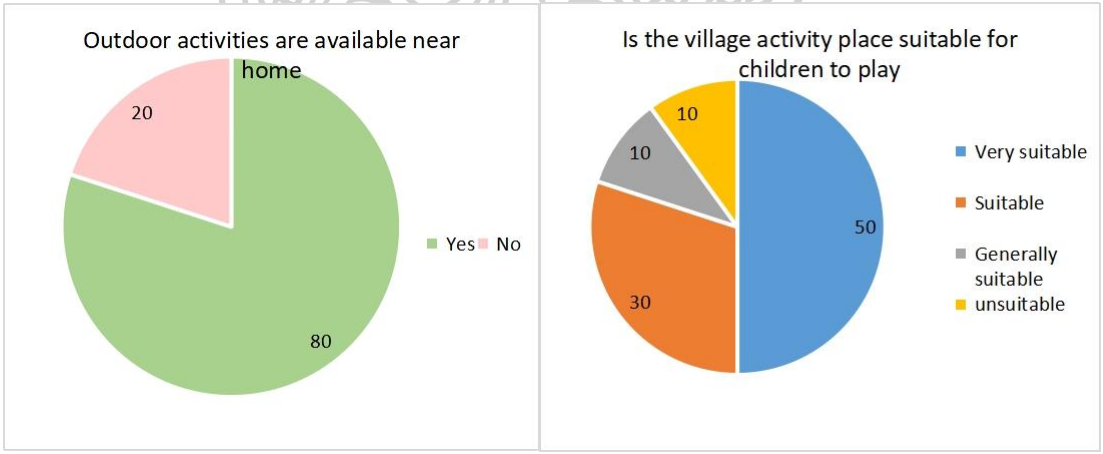


Figure 48 Analysis of the returned data of parental questionnaires

Source: Self-drawn by the author, 2022

However, the survey also found some things that could be improved. A certain percentage of parents said their children have problems with the hygiene and safety of their activity places. Specifically, about 30% of parents said the hygiene of

activity places needed to be improved, while 20% said there were safety hazards in the activity places. Furthermore, several parents stated that their towns or communities lacked areas suited for children's activities and that new places needed to be constructed.

In summary, there are also families in villages that lack places suitable for children's activities and need to be strengthened to meet the needs of children for more activities.

(3) Analysis of the Returned Data of the Teacher Questionnaire

In Figure 49, 85 percent of the teachers responded that their school had activity areas explicitly designed for children, of which 25% felt that these areas met children's activity needs very well, 45% felt that they met them reasonably well, 20% felt that they met them generally, and only 5% felt that they did not. In addition, 70% of the teachers responded that their school had safe playgrounds for children, with 20% considering these playgrounds to be very safe, 40% considering them to be somewhat safe, and only 10% considering them to be generally safe. These results indicate that most schools already provide dedicated spaces and playgrounds for children and that teachers recognize the quality of these spaces.

However, a certain percentage of teachers still believe that schools should add or improve children's activity areas. Specifically, 90% of teachers believe schools should add or improve these spaces. They believe that facilities such as sports fields, children's libraries, computer rooms, swimming pools, and gymnasiums must be added. In addition, 20% of the teachers thought that the school's green belts, parks, and other outdoor activity areas were not beautiful and airy, indicating that some schools' environments still need to be improved.

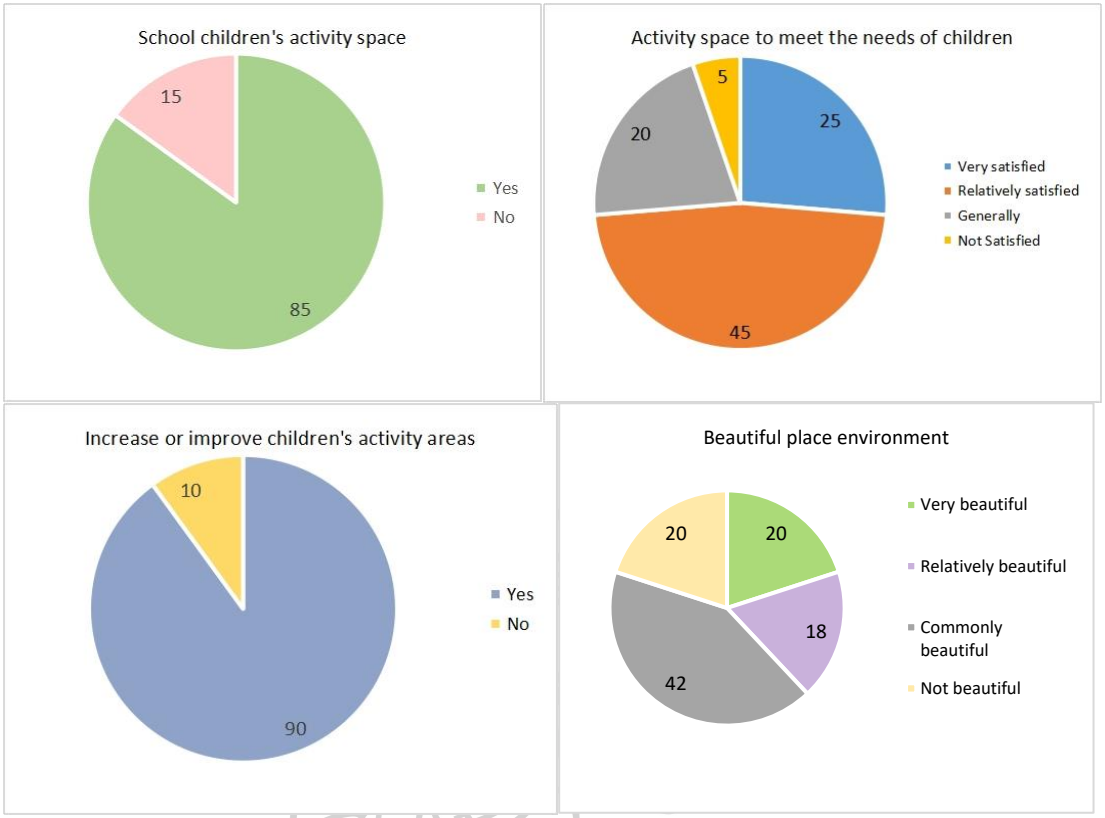


Figure 49 Analysis of the returned data of the teacher questionnaire

Source: Self-drawn by the author, 2022

In summary, most schools already provide dedicated activity spaces and playgrounds for children, and teachers recognize the quality of these spaces. Some teachers, however, feel that schools should build or improve these areas to suit children's requirements for more activities. In addition, the environment of some schools needs to be improved to provide better places for outdoor activities. As a result, schools may consider instructors' suggestions further to improve the kid's play space setting and create a better atmosphere for children to grow.

(3) Summary

The above-recovered questionnaire induction analysis provides a more relevant and realistic basis for the later design practice. The following points are summarized:

1) Spatial perception ability Children's cognitive development needs a spatial environment; the so-called "spatial environment" is composed of two parts:

the enormous spatial environment, that is, to understand the environmental conditions after entering space. The other part is the small spatial environment, i.e., the ability to perceive space. Therefore, the researcher believes that spatial perception is the best way to improve children's perception of the environment.

2) Natural elements use the activity center design uses natural forms as the primary design technique. The details are combined with geometric forms to give children a rich sense of experience.

3) Emotional resonance ability as most rural left-behind children have psychological problems, sometimes they cannot express their emotions correctly or understand others' emotions. In the design, children's empathy ability is improved through the creation of emotional space.

4.1.5 Analysis of Expert Interview Results

4.1.5.1 Architectural Design Experts

(1) The design should consider the unique requirements of kids left behind, including their safety, play space, learning space, and interaction space.

(2) Interior spaces should be open and airy, allowing sunlight and nature to enter. Provide rich and diverse play and learning facilities, and ensure the quality and safety of these facilities.

4.1.5.2. Environmental Design Experts

(1) The design should consider the natural features and cultural atmosphere of the surrounding environment to provide an environment close to nature and rich in local characteristics for children.

(2) Consider the size and style of the activity room to suit children of varying ages.

4.1.5.3. Regional Cultural Experts

Pay attention to the inheritance of regional culture: It is recommended to fully consider the characteristics and inheritance of regional culture in the design of the activity center and integrate local characteristics and cultural elements into the construction of the activity center as much as possible so that children are not only exposed to games and learning in the activity center but also the awareness and feeling of regional culture.

Reflect the vernacular architectural style: It is recommended that the local vernacular architectural style be reflected in the architectural design of the activity center, such as the form, material, and color of the building so that the activity center can be more integrated into the local environment and atmosphere, and at the same time improve the children's knowledge and feeling of the vernacular architectural culture.

4.1.5.4. Child Psychologists

(1) Pay attention to the mental health of left-behind kids and offer psychological evaluation and counseling services.

(2) Please pay attention to left-behind children's parent-child relationships and urge parents to actively engage in their children's growth and education.

4.1.5.5 Sociology and Social Worker Experts

(1) Actively organize social resources to assist and support disadvantaged children's living situations and educational environment.

(2) Create an effective social network to help left-behind children with living and learning needs.

4.1.6 Analysis of the Results of User Needs Survey Data

The valid surveys received were used to outline the demands of rural left-behind children for activity space (Figure 50). The four needs are: entertainment needs, social needs, educational needs, and emotional needs. The researcher analyzed the four needs.

Figure 50 The needs of rural left-behind children for activity space

Source: Self-drawn by the author, 2022

Entertainment needs: Providing an entertainment place where they can relax can enable left-behind children to relax, soothe themselves, interact with friends, and enhance their well-being after school.

Social needs: In the design of the activity center, more space for interaction should be designed to allow them to integrate into normal interpersonal relationships and meet their average social needs.

Educational needs: with functional space to provide learning, introduce extracurricular learning interests, and extend the knowledge inside and outside the classroom for left-behind children.

Emotional needs: interrelated with the needs of the first 3 points and rising to the spiritual level, from the perspective of children's emotional deficiency, so that left-behind children can be emotionally compensated in the activity space.

Based on the summarized user needs, the researcher continued to use the fieldwork method to record the usual entertainment of rural children through observation and filming and to record children's entertainment behavior from a bystander's perspective through qualitative research, non-participant observation method to understand the meaning of the phenomenon or behavior. Moreover, storyboard drawing is used for children's play elements to extract design elements and apply the final results to the design.

4.1.6.1 Entertainment Needs

The researcher studied the typical games of rural left-behind children to understand their recreational preferences, methods, and purposes. This information can be used as a reference for the design of activity centers to consider their interests and needs in the selection and setting of game facilities, to develop recreational activity programs with unique features, and to improve their participation and satisfaction.

The fun nature of games and entertainment has exceptional value for children's development. The rich experience of games enables left-behind children to achieve, to some extent, a standard of physical and mental health, thus promoting overall development in terms of physical development, thought expression, and behavior. At the same time, the play brings a rich sense of experience that allows children to give full play to their creativity. Children stimulate their sense of excitement

and desire for exploration by climbing, running, sliding, balancing, jumping, hiding, spinning, and other ways of movement (Figure 51), in the storyboard boards.

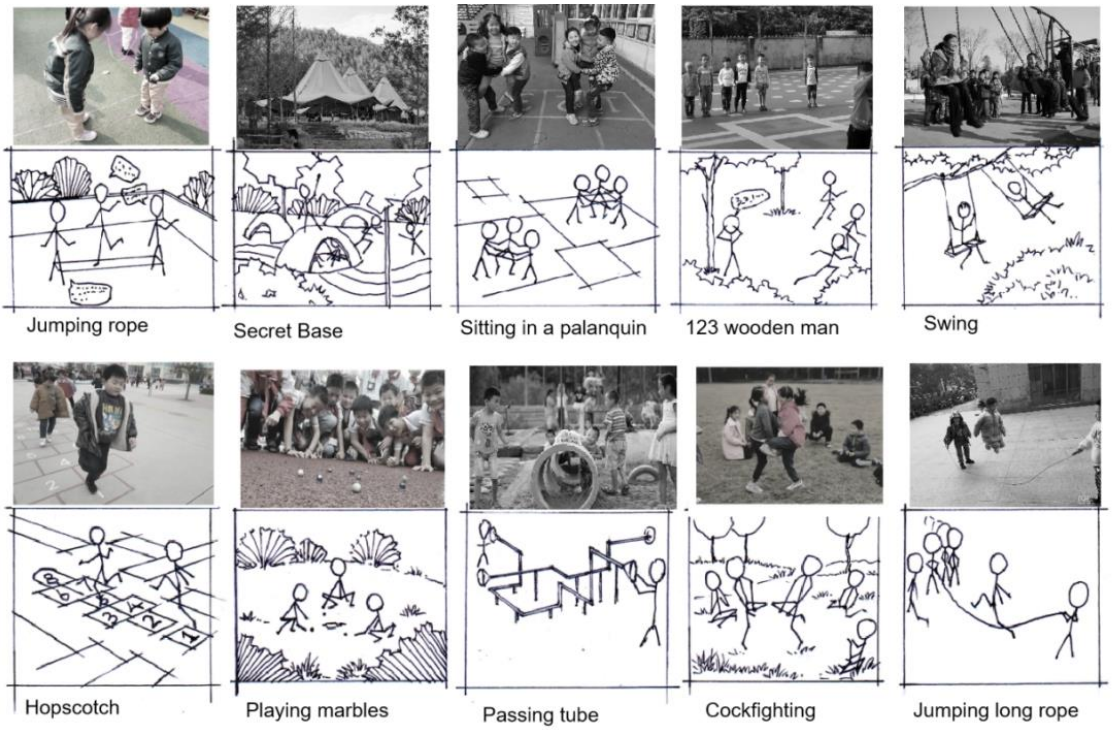


Figure 51 Observation records of children's play behavior

Source: Self-drawn by the author, 2022

Left-behind children need to know nature, themselves, and others in rich recreational activities. We should provide them with a wide variety of activities, make use of the neighboring natural environment, hills, river valleys, and streams as much as possible, create spaces with high and low levels, expand children's spatial experience, and provide children with a safe and colorful environment where they can contact nature and grow their knowledge.

The researcher obtained information from children's play activities, as shown in Figure 52. children enter the play activity space and are subject to certain perceptions that stimulate their expressiveness, exploration, and interest level. Then through participation and feedback to the children themselves. Children needed critical information throughout the activity: interest, security, and freedom.

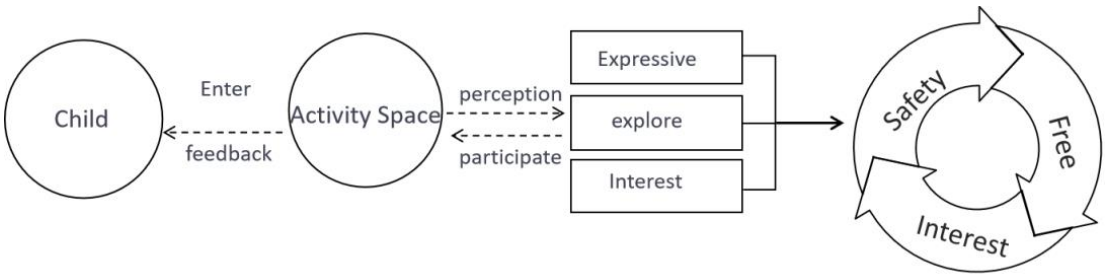


Figure 52 Children get information during play

Source: Self-drawn by the author, 2022

Therefore, the activity center needs to strengthen children's natural play and environmental learning abilities, combine nature with the indoor and outdoor design of the activity center, and provide a variety of opportunities for left-behind children to develop their abilities.

4.1.6.2 Social Needs

The lack of affection for rural left-behind children makes them more eager to be cared for and recognized by others. However, this lack makes them inferior and introverted, and it is all the more critical for society to devote equal respect and care to them to let them integrate into normal interpersonal relationships and satisfy their average social needs.

The researcher's observation record of the left-behind children found that he fulfills his social needs by establishing friendships with his peers. This includes getting to know each other, establishing close relationships, sharing interests and activities, and supporting each other. They learned to express their feelings, needs, and ideas and to listen to and understand others (Figure 53). This communication process helps to develop the language and social skills of the children left behind and helps children develop skills of trust, cooperation, and sharing.

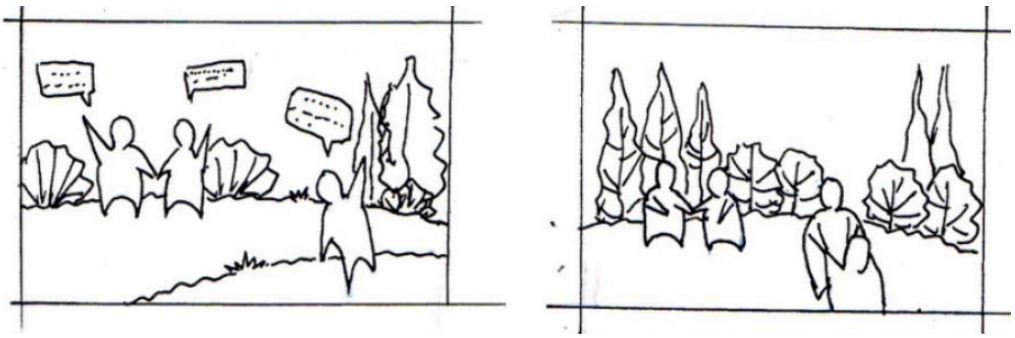


Figure 53 Record of children's social observation

Source: Self-drawn by the author, 2022

Therefore, in designing activity spaces for left-behind children in rural areas, more interaction spaces should be designed to meet the needs of children in rural areas for socialization. At the same time, Internet technology should be introduced to meet the parent-child interactions between the left-behind children and their parents working outside the country to strengthen the emotional bond. The following are the social needs of left-behind children as reflected in the observation records:

Communication needs with family and relatives: Because left-behind children are frequently separated from their parents and relatives, they must connect with their families and relatives to maintain contact with their distant relatives and demonstrate their growth and improvement in front of their families.

The need for interaction with peers: Left-behind children need more company and communication with peers in their lives and studies, so they need interaction with peers. Interaction with peers can improve their self-confidence and self-esteem through mutual encouragement and support.

The need to develop social adaptability: Due to their families' long-term lack of care and companionship, their social adaptability could be more robust. Please provide them with appropriate social opportunities and environments to promote the development of their social adaptation abilities.

The need to gain respect and attention: Left-behind children often feel neglected and marginalized in life and lack the attention and respect of others. Designers should respect the needs and wishes of left-behind children and provide warm and caring services and environments so that they can feel their value and sense of existence and enhance their self-esteem and self-confidence.

4.1.6.3 Educational Needs

The education level in rural areas is low, learning resources are in short supply, and most schools need to be more robust regarding education concepts and facilities. With the data collected through the preliminary questionnaire survey, interviews, and observations, the researcher found that the way to acquire knowledge for left-behind children can be through visiting learning and centralized learning (Figure 54). Visiting study can be in the form of exhibition activities, introducing new knowledge and information to children, helping them to understand the fields of history, science, art, and culture, and stimulating their interest and curiosity. When focusing on learning, left-behind children need a functional space to study and complete homework. Providing left-behind children with a good learning environment in the Children's Activity Center is of great significance to the children's learning progress. The following are the educational needs of left-behind children as reflected in the observation records:

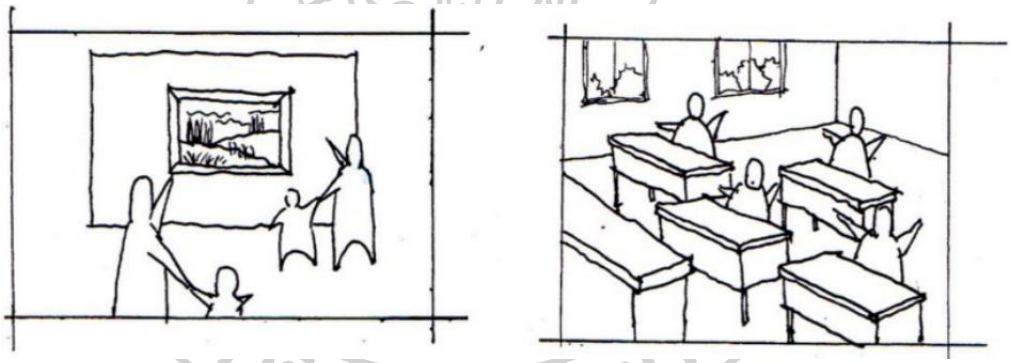


Figure 54 Child education observation records

Source: Self-drawn by the author, 2022

Extracurricular interest education: various opportunities for extracurricular interest education, such as music, art, sports, and handicrafts.

Social education: learning how to get along with others, express themselves, and resolve conflicts.

Psychological education: Rural left-behind children often feel lonely, helpless, anxious, and other negative emotions, so they need to get relevant psychological education to learn how to deal with frustration, how to build self-confidence,

To sum up, activity centers for rural left-behind children must meet these educational needs and help left-behind children develop comprehensively.

4.1.6.4 Emotional Needs

Left-behind children usually cannot take care of them because their parents go out to work, so they intensely crave family companionship. The researcher observed and recorded that left-behind children may feel lonely, anxious, and uneasy because they lack the warmth and care of their families. They want to feel safe and stable in the company of their parents (Figure 55). The desire to be pampered and the parent-child relationship also positively affect children's growth and development. Parental companionship provides emotional support and promotes children's social skills, emotional intelligence, and mental health.

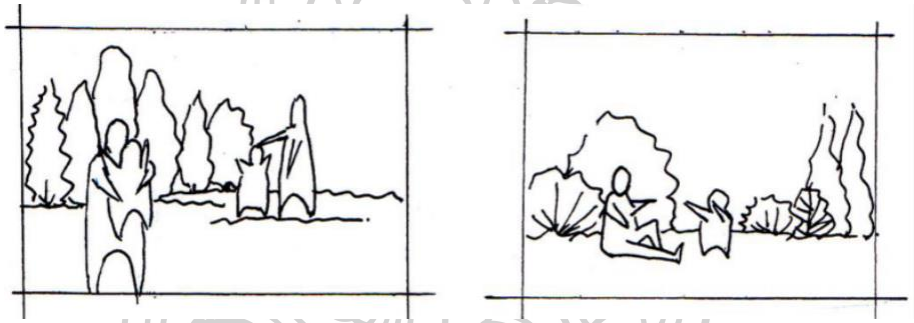


Figure 55 Child emotional observation record

Source: Self-drawn by the author, 2022

This kind of kinship is about material provision and includes emotional care, concern, and companionship. They want to see their parents and establish a closer parent-child relationship with them. The following are the emotional needs of left-behind children as reflected in the observation records:

Need for security: Left-behind children often feel lonely, helpless, and afraid after experiencing their parents' separation from home and working outside. Therefore, they need a safe environment to get psychological comfort and support.

Care needs: Since their parents have been away for a long time, left-behind children need attention and care from other adults to make them feel warm and valued.

Relational needs: Children who have been left behind have limited chances to contact their relatives and are eager to get their care and attention. The

activity center can provide certain family contact services so left-behind children can keep in touch with their families.

Self-realization needs: Left-behind children also have their dreams and pursuits. They hope to get more opportunities in the activity center to explore their potential and realize their values. Activity centers should provide diversified activities and resources to allow left-behind children to be exposed to different fields, expand their horizons, and improve their self-awareness and self-confidence.

4.1.7 Analysis of Hunan Regional Survey Results

4.1.7.1 About Hunan

(1) Introduction to Hunan Province

Hunan Province is in central China, with a surface of 211,800 square kilometers and over 68 million people. It is a famous cultural province with a long history and is rich in historical and cultural heritage and tourism resources. Hunan has the title "Chu Culture" and is the hometown of the Chu Kingdom.

Hunan's climate is subtropical and humid, with four seasons, suitable temperatures, and abundant precipitation. Due to its location, Hunan is rich in natural resources, including forests, grasslands, water resources, and minerals.

(2) Overview of the Hunan countryside

Most of the rural areas in Hunan Province are in the south-central region of Hunan, including the mountainous areas of southern Hunan and western Hunan. These areas have a beautiful natural environment, a warm and humid climate, fertile land, and rich resources in agriculture, forestry, and animal husbandry.

Hunan's rural areas are more populated, with farmers and rural laborers being the main population groups. The Hunan province government has recently implemented several policies and initiatives to promote rural regeneration, economic growth, and farmer well-being. At the same time, rural areas in Hunan face some problems, such as increased left-behind children, an aging population, rural exodus, and backward rural infrastructure.

In rural areas of Hunan, traditional rural culture remains, such as traditional festivals, folk music, drama, and handicrafts. These cultural heritages have become an essential part of Hunan's rural culture.

(3) Summary

Based on the research, the researcher found that the rural environment and regional culture of Hunan are similar. These influence the design and implementation of activity centers for children left behind in rural Hunan, which need to consider the local natural environment, cultural traditions, social habits, and economic development status to develop a design plan that meets the actual local situation.

The researcher takes the next step in analyzing the rural environment and regional cultural aspects regarding design elements.

4.1.7.2 Environmental and Natural Conditions

(1) Climatic Factors

Hunan is located in southern China and has a subtropical monsoon climate with considerable rainfall, with most areas receiving an average annual rainfall of over 1,000 mm. The climate is mild and humid, with hot southern summers and average temperatures between 25-30 degrees Celsius. The four seasons are distinct. Water and soil resources are abundant. The buildings in this region are also mainly insulated in summer, and the most significant energy consumption of the buildings lies in cooling down in summer, so the construction should focus on insulation and natural ventilation in the transitional season.

The researchers used “climate consultants” to conduct climate collection and strategic recommendations for the Hunan region, and selected major data for analysis for design reference.

Temperature Range: The graph shows the temperature range and comfort zone. The graph shows that the year-round temperature comfort zone for the Standing area is in the 68-79 degrees Fahrenheit range. The lowest extreme cold climate is 30 degrees Fahrenheit. The climate in Changde is relatively mild and humid, with hot southern summers with average temperatures between 77 to 86 degrees Fahrenheit (25 to 30 degrees Celsius) and four distinct seasons. In designing areas with good shading and oriented to prevailing winds, good natural ventilation can reduce the building's excessive energy consumption (Figure 56).

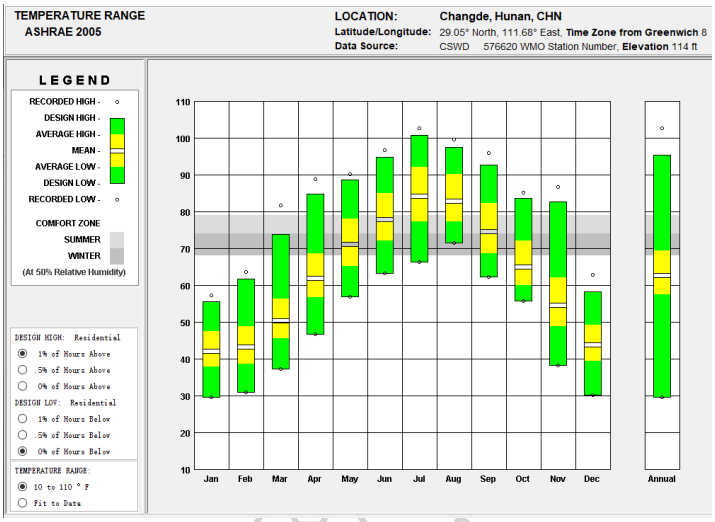


Figure 56 Temperature range

Source: Produced by the author from climate consultants, 2022

Relative Humidity: The graph shows the relative humidity at various stages of the year in the Standing area. The graph shows the humidity float in green and the dry bulb temperature in yellow. The graph shows that the humidity and dry bulb temperature are most comfortable in Changde from May to September. When building for warm and humid conditions, conventional passive houses can be created with high ceilings and large openable windows sheltered by thick overhangs and balconies to produce the most pleasant spatial arrangements (Figure 57).

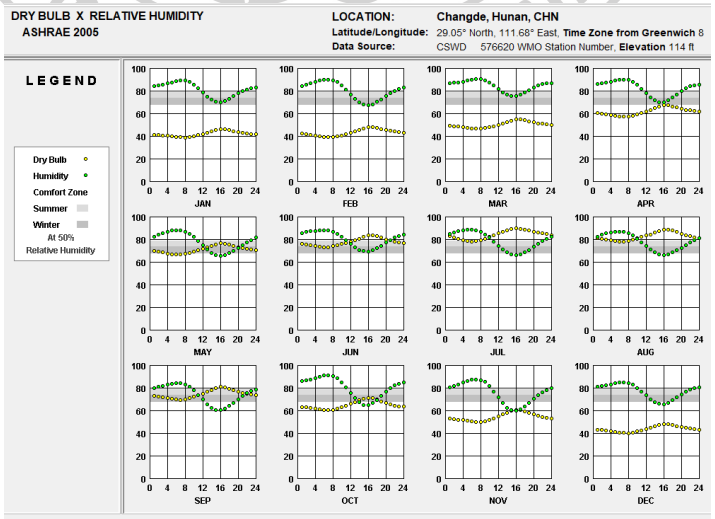


Figure 57 Relative Humidity

Source: Produced by the author from climate consultants, 2022

Sunrise and sunset schedule: The graph show the sunrise and sunset schedules in the Changde area during the year. Combined with the temperature display in the graph, it can be seen that the Changde area has a natural combination of high daytime solar radiation in the summer resulting in sudden temperature increases and low daytime solar radiation in the winter. In terms of design, consider the use of ceramic tile or slate or wood floors or stone-faced fireplaces, all of which provide sufficient surface area to store solar radiation during the day in winter and "coolness" at night in summer (Figure 58).

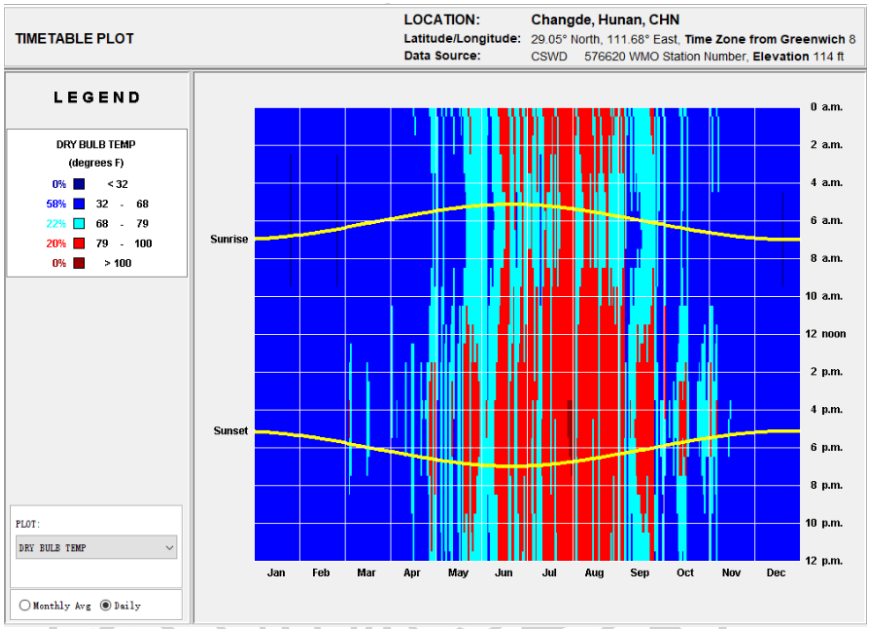


Figure 58 Sunrise and sunset schedule

Source: Produced by the author from climate consultants, 2022

Enthalpy and humidity diagram: This picture are the temperature, enthalpy and humidity diagram of Changde area. From January to mid-December (Figure 59):

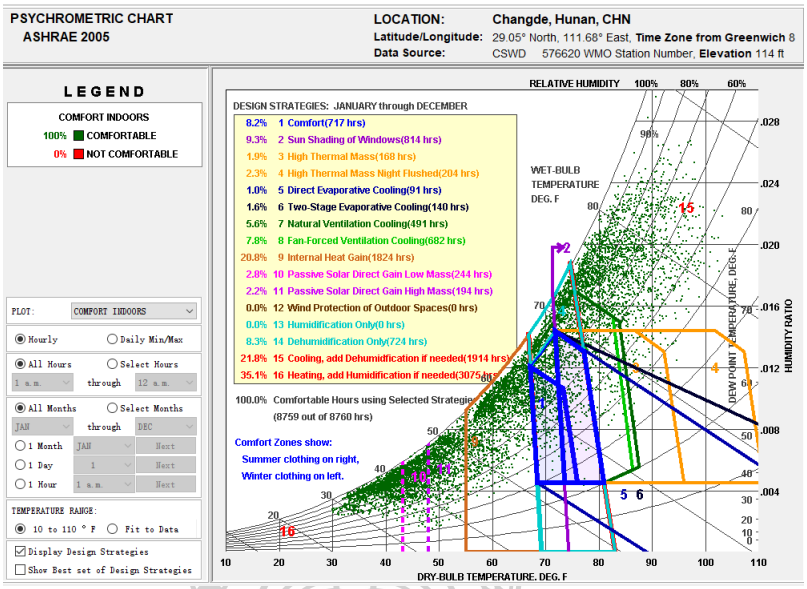


Figure 59 Enthalpy and humidity diagram

Source: Produced by the author from climate consultants, 2022

1. 8.2% comfortable (717h)
2. 9.3% window shading (814h)
3. 1.9% high heat storage (168h)
4. 2.3% high heat storage + night ventilation (204h)
5. 1.0% direct evaporation cooling (91h)
6. 1.6% indirect evaporation cooling (140h)
7. 5.6% natural ventilation (491h)
8. 7.8% fan drive cooling (682h)
9. 20.8% internal heat gain (1824h)
10. 2.8% passive solar heat gain + low heat storage (224h)
11. 2.2% passive solar heat gain + high heat storage (194h)
12. 0.0% of outdoor space is protected from wind (0h)
13. 0.0% simple humidification (0h)
14. 8.3% simple dehumidification (724h)
15. 21.8% refrigeration, dehumidification if necessary (1914h)
16. 35.1% heating, humidification if necessary (3075h)

It can be seen from the psychrometric chart that the overall climate in Changde still needs to be controlled by external factors. Among them, the overall

comfort zone is concentrated in the middle part. Only 8.2% (717h) of the year is very comfortable, and the proportion of cold in winter reaches 35.1% (3075h). Active heating methods such as setting up stoves are required for heating, humidification means need to be adopted when necessary.

Double high-performance glass was put on the west, north, and east façades for optimal passive solar gain, while transparent glazing was constructed on the south façade. For passive solar heating, the areas that need to be glazed face south to maximize sunlight in winter, while also considering the overhanging parts of the building for adequate shading in summer.

Design Strategy Recommendations: The "climate consultants" gave 16 design recommendations. In the design of the left-behind children activity center， the following five recommendations were used as design references (Figure 60).

1) For optimal passive solar gain, install double-pane high-performance windows (Low-E) to the west, north, and east, but leave the south clear.

2) Maintaining a suitable building size, window overhang, or moveable awning can decrease or eliminate the need for air conditioning.

3) Reduce heat in the summer and fall by increasing permeability and minimizing west-facing windows.

4) Use plant materials to reduce heat gain, especially in the west (where summer rainfall encourages native plant growth).

5) A narrow building layout can enhance natural ventilation in moderate and hot, humid regions.

DESIGN GUIDELINES (for the Full Year) | **LOCATION:** Changde, Hunan, CHN
ASHRAE 2005 | **Latitude/Longitude:** 29.05° North, 111.68° East, **Time Zone from Greenwich** 8
All Design Strategies, Default Criteria | **Data Source:** CSWD 576620 WMO Station Number, **Elevation** 114 ft

Assuming all 16 Design Strategies were selected on the Psychrometric Chart, 100.0% of the hours will be Comfortable.
This list of Residential Design guidelines applies specifically to this particular climate, starting with the most important first.
Click on a Guideline to see a sketch of how this Design Guideline shapes building design (see Help).

20	Provide double pane high performance glazing (Low-E) on west, north, and east, but clear on south for maximum passive solar gain
18	Keep the building small (right-sized) because excessive floor area wastes heating and cooling energy
59	In this climate air conditioning will always be needed, but can be greatly reduced if building design minimizes overheating
19	For passive solar heating face most of the glass area south to maximize winter sun exposure, but design overhangs to fully shade in summer
11	Heat gain from lights, people, and equipment greatly reduces heating needs so keep home tight, well insulated (to lower Balance Point temperature)
3	Lower the indoor comfort temperature at night to reduce heating energy consumption (lower thermostat heating setback) (see comfort low criteria)
65	Traditional passive homes in warm humid climates used high ceilings and tall operable (French) windows protected by deep overhangs and verandahs
37	Window overhangs (designed for this latitude) or operable sunshades (awnings that extend in summer) can reduce or eliminate air conditioning
35	Good natural ventilation can reduce or eliminate air conditioning in warm weather, if windows are well shaded and oriented to prevailing breezes
38	Raise the indoor comfort thermostat setpoint to reduce air conditioning energy consumption (especially if occupants wear seasonally appropriate clothing)
42	On hot days ceiling fans or indoor air motion can make it seem cooler by 5 degrees F (2.8C) or more, thus less air conditioning is needed
4	Extra insulation (super insulation) might prove cost effective, and will increase occupant comfort by keeping indoor temperatures more uniform
1	Tiles or slate (even on wood floors) or a stone-faced fireplace provides enough surface mass to store winter daytime solar gain and summer nighttime 'coolth'
46	High Efficiency air conditioner or heat pump (at least Energy Star) should prove cost effective in this climate
15	High Efficiency furnace (at least Energy Star) should prove cost effective
33	Long narrow building floorplan can help maximize cross ventilation in temperate and hot humid climates
8	Sunny wind-protected outdoor spaces can extend living areas in cool weather (seasonal sun rooms, enclosed patios, courtyards, or verandahs)
68	Traditional passive homes in hot humid climates used light weight construction with openable walls and shaded outdoor porches, raised above ground
39	A whole-house fan or natural ventilation can store nighttime 'coolth' in high mass interior surfaces (night flushing), to reduce or eliminate air conditioning
5	Carefully seal building to minimize infiltration and eliminate drafts, especially in windy sites (house wrap, weather stripping, tight windows)

Figure 60 Design Strategy Recommendations

Source: Produced by the author from climate consultants, 2022

The climate data collection and design strategy reference obtained by Climate Consultant provides a more scientific basis for thinking about the program later on.

(2) Local Materials

Hunan is a cultural province with a long history and rich natural and cultural resources, so the local materials are also vibrant and diverse. The following are some representative local materials in Hunan (Figure 61):

Figure 61 Major local materials in Hunan

Source: Photo by author, 202

Wood as a traditional building material, wood is widely used in construction in the Hunan region. The mountainous region of Hunan is rich in resources and has a wide variety of species, among which the more common ones are pine, cypress, and hinoki. Wood is complicated and can be used to build foundations, frames, roof beams, other building components, interior flooring, doors, windows, furniture, and other decorations.

Bamboo is abundant in the Hunan region and is widely used in construction. Bamboo is hard while being light in weight and good at heat insulation, so it is often used to build walls, roofs, and other building components and to make indoor partitions and furniture.

Blue bricks are a traditional building material widely used in the construction of the Hunan region. Blue bricks are gray-green and are often used to build exterior walls, interior walls, and other components with a fine texture on their surface for decoration.

Red brick is also a traditional building material widely used in the construction of the Hunan area. Red bricks are red and are often used to build exterior walls, interior walls, and other building components with a rough texture on their surface, which can be used for decoration.

Earth is a traditional building material widely used in the construction of the Hunan region. Earth is a building material mixed with clay, lime, loess, and other materials with good thermal insulation and durability and is often used to build foundations, walls, and other building components. At the same time, the surface of rammed earth has a natural texture and can be used for decoration.

4.1.7.3 Regionality Studies

(1) Architectural Characteristics

Residential buildings: primarily wooden structures with brick and wood combined walls and roofs covered with green tiles. This traditional architecture has specific waterproof and breathable performance and can adapt to Hunan's rainy and humid climate. Focusing on integrating the natural environment, it mainly adopts a courtyard layout and creates a comfortable living environment with enclosed space.

Religious architecture: Religious beliefs are relatively diverse, including Buddhism, Taoism, and Christianity. Therefore, you can see temples,

churches of different religious beliefs, and other buildings in the area with a solid religious atmosphere and local characteristics.

Ancient buildings: There are many ancient buildings preserved, such as government offices, city gates, and ancestral halls in the Ming and Qing dynasties, which are not only the local cultural heritage but also an essential source for studying the history and culture of Hunan.

The researchers extracted elements from the characteristics of Hunan's regional houses and followed the semi-enclosed structural form of the building (Figure 62).

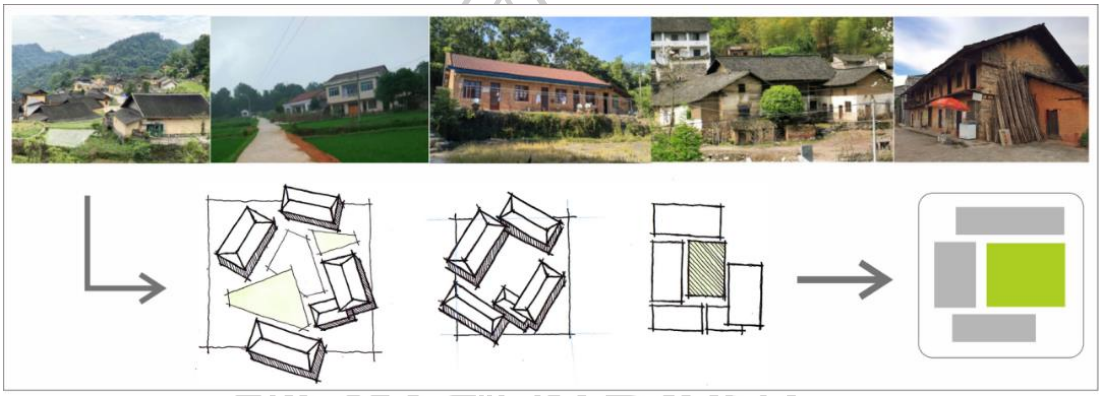


Figure 62 Extraction of residential elements

Source: Photo and drawn by author, 2022

(2) Street Texture

Hunan rural street layout, usually showing "straight, curved, narrow, wide, scattered" and other forms, generally uses the "bar system" or "field grid" layout to adapt to the layout, which is generally "barred square" or "field grid" to suit the local geographical environment and lifestyle. The researcher extracts the relevant street texture elements and follows the small-scale village street form (Figure 63).

Figure 63 Extraction of street texture elements

Source: Photo and drawn by author, 2022

(3) Vegetation Characteristics

Hunan's rural plant resources are vibrant, with vegetation types dominated by deciduous broad-leaved forests and small amounts of evergreen broad-leaved forests, coniferous forests, and grasslands. Plant features mainly include bamboo, tea, fruits, herbs, wood, and flowers, which have economic and ornamental values and reflect local geographical and climatic characteristics. The researcher performs element extraction of relevant plant features and screens planting symbols (Figure 64).

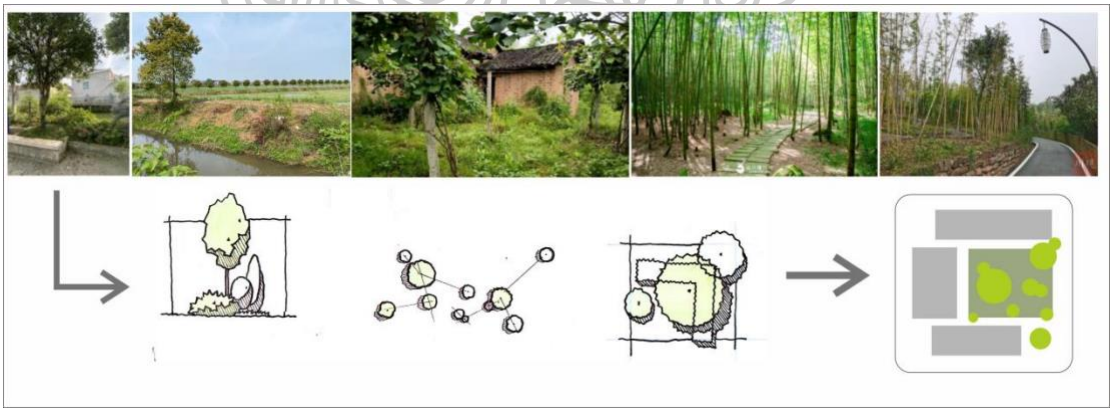


Figure 64 Extraction of local plant elements

Source: Photo and drawn by author, 2022

(4) Folk Culture

Folk culture is rich in folk arts, including songs and dances, folk instrument playing, handicrafts, and other forms. Among them, wood carving, stone carving, embroidery, and opera are famous. Local folk songs and dances usually reflect

various scenes and emotions in life and are full of a rich vernacular atmosphere. The researcher performs element extraction of relevant folk culture and integrates folk characteristics (Figure 65).

Figure 65 Extraction of folk culture elements

Source: Photo and drawn by author, 2022

(5) Historic Sites

Hunan is a region with a long history and many famous historical sites. The following are some representative ones: Yueyanglou, Mawangdui Han Tomb, Shaoshan Mao's former residence, Hengshan Mountain, Yuelu Academy, cellar house, Peach Blossom Source, famous people's former residence, Wulingyuan, Yaoshan Cave, Longquan Temple Pagoda. The researcher carries out the element extraction of relevant relics while respecting the history (Figure 66).

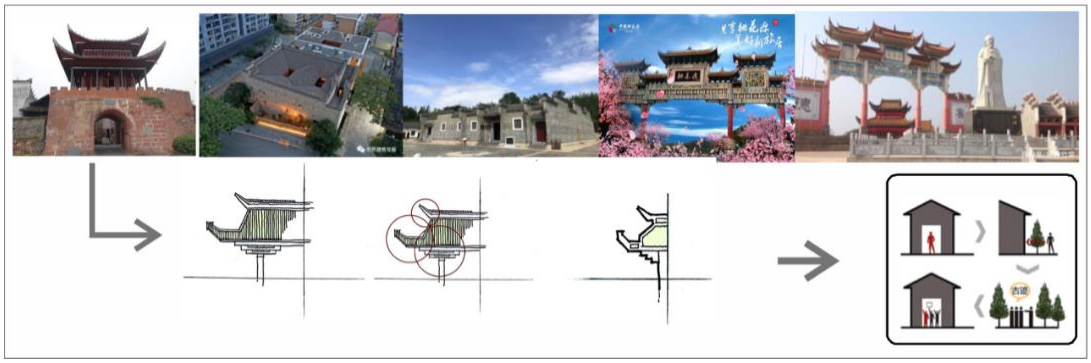


Figure 66 Extraction of historical site elements

Source: Photo and drawn by author, 2022

4.2 Designing Experiments

4.2.1 Experiment with the Design of a Left-Behind Activity Center in Chaanpu Town

4.2.1.1 Purpose

Based on the field survey and questionnaire results, the researcher analyzed and concluded that the left-behind children have four needs. The first design experiment was conducted to meet the four needs as the purpose of the experimental study. To give left-behind children a secure, healthy, and happy environment to grow and develop their full potential and gifts.

4.2.1.2 Conceptual Design and Results

(1) Project Overview

The project site is located in Chaanpu Town, southwest of Hunan Province, and belongs to Taoyuan County of Changde City, about 100 km from downtown Changde. The project covers an area of about 390 square meters and proposes constructing a two-story building with a total construction area of about 210 square meters.

(2) Conceptual Design

Recreational needs: The recreational requirements of left-behind kids are diverse, so in the design experiment, the researcher designed the children's activity room, which can be used as a multifunctional space to read, play, and play sports. In actual use, a space can be designed into multiple functional areas to accommodate different recreational needs.

Social needs: Encourage communication and interaction among left-behind children and develop their social skills. Set up areas suitable for group activities, and the design sets up rest areas, reading areas, and game areas.

Educational needs: the setting of learning space. Left-behind children need a quiet, warm, and comfortable learning space. The researcher set up a reading, computer, and desk environment for the left-behind kids based on their age and learning content. Learning entails not only acquiring knowledge but also developing hobbies and interests. The indoor and outdoor spaces are set up with drawing and craft areas, allowing left-behind children to show themselves and cultivate their interests.

Emotional needs: The researcher used the sense of security, closeness, freedom, and belonging to meet the emotional needs in the design. Warm and soft colors, materials, and lighting create a warm atmosphere. Open activity spaces and pleasant communication environments allow left-behind youngsters to connect and converse with their classmates, improving their social skills, sense of belonging, and moods.

Embodied in the functional division: In the area of the activity center for left-behind children, considering its space limitation and various factors of children's psychology and behavior, the project addresses four needs of left-behind children: entertainment, socialization, education, and emotion. The main functions are divided into three spaces: the reading room, the activity room, and the outdoor play area (Figure 67).

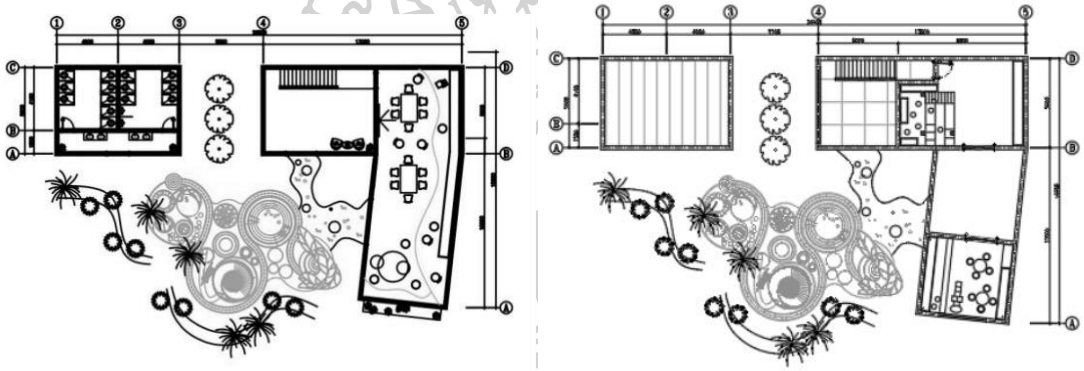


Figure 67 Functional zoning diagram of the first and second floors

Source: Self-drawn by the author, 2022

In terms of the requirements of children who have been left behind, the spatial movement line in Figure 68 is divided into a learning activity area and an entertainment and leisure area. Each functional partition is sparse and well organized, and the dynamic line has a good orientation.

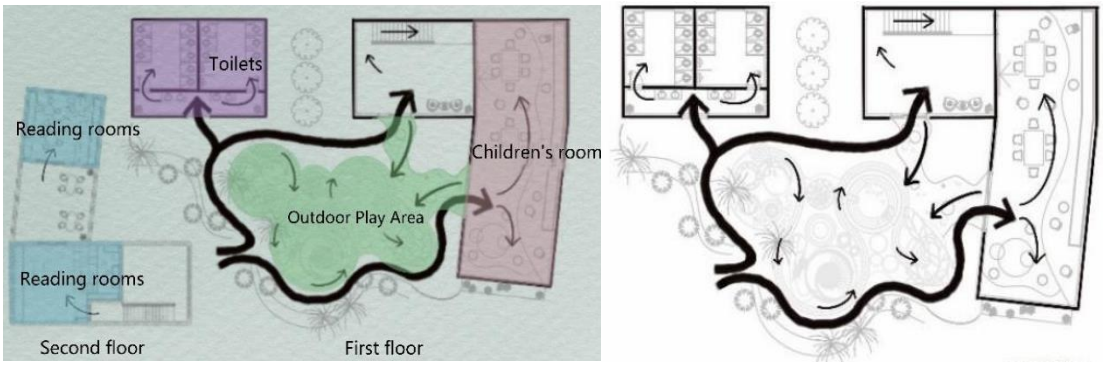


Figure 68 Space division map

Source: Self-drawn by the author, 2022

Embodiment in the design of space: Reading room design is based on meeting left-behind children's educational, social, and emotional needs, reflecting humanistic sentiment, and caring for the disadvantaged. From the psychological point of view of the left-behind children, the overall design is simplified by the warm and comfortable color combination to fill the gap in their hearts so that the left-behind children have a comfortable and restful environment. In the space design, the colors of natural materials such as "tea" and "bamboo" were extracted and incorporated into the interior through accents. Wooden bookshelves, bookcases, and ladder seats complement each other, while trees and white clouds decorate the walls to reflect the natural texture. The seats on the ladder are made of fabric textiles and have a round shape to minimize the bumping of children and reflect comfort. The whole space allows maximum use of natural light, and the surrounding walls are treated with acoustic cotton to reduce the impact of the outdoors on the interior effectively. Let the left-behind children be in nature and create a comfortable, quiet reading space with humanistic feelings (Figure 69).

Figure 69 Reading Room Design Plan

Source: Design by author, 2023

Activity room design: a space that meets the left-behind children's recreational, social, and educational needs and reflects participation. The wall is effectively used as a display area for the children's work. The chairs have backrests shaped like tea leaves, adding a different character to the space. The interior walls are the same as the reading room, with white and log-colored bookshelves chosen to match each other, giving the left-behind children a gentle and natural perception of the environment. Interior lighting combines artificial and natural light, creating a practical and relevant lighting environment (Figure 70).

Figure 70 Activity room design drawings

Source: Design by author, 2023

Outdoor play space design: The design is planned based on preserving the native terrain and combining it with the site's function. The primary color, combined with the natural environmental conditions, sets up a green belt, guides left-behind children to get close to nature, perceives nature, and creates a naturalized

entertainment and play space. The outdoor play area mainly meets left-behind children's entertainment and social needs. Outdoor play facilities include combination slides and sunken net rope climbing. The pavilion is constructed, and the shape of tea leaves is extracted as the ceiling to give an outdoor resting space for children left behind and their guardians. The colors in the room, as well as the matching of various amenities, make the entire play area more fun (Figure 71).

Figure 71 Outdoor play area design drawings

Source: Design by author, 2023

(3) Summary

The literature review, field survey, and questionnaire contributed significantly to this study because they supplied the genuine requirements of the left-behind children and highlighted the key directions in the design of the space to create a foundation for constructing an activity center suited for them. From fieldwork to design conception, from theory to design, the researcher had the opportunity to observe, learn, and solve problems through conceptual design. It accumulates relevant knowledge and shows the direction for designing experiments with activity centers for children left behind in different villages.

(4) Expert advice

The design of activity centers for left-behind children is based on four indicators, namely, "recreational needs, social needs, educational needs, and emotional needs", and experts are allowed to review and evaluate the centers and make appropriate recommendations (Table 15).

Table 15 Experiment 1 expert advice

Indicators	Evaluation content	Recommendations
Recreational needs	Recreational venues are varied and encourage interaction.	Add some interactive play facilities to the indoor play area.
Social needs	Provide a variety of interactive activities and networking venues.	Add some teamwork-type activities to encourage cooperation and communication among left-behind children.
Educational needs	Provide learning spaces and educational resources.	Add some science books and teaching aids to enhance the interest of left-behind children in learning.
Emotional needs	Provide psychological counseling and family care.	Increase some emotional support activities and psychological counseling services to improve left-behind children's mental health.

Suggestions: The activity center is small, and although it meets the needs, it is too homogeneous regarding the functional division. The functions can be set for social and emotional needs, strengthen the counseling and support of professionals, increase the relevance and effectiveness of activities, and improve the social and emotional ability of left-behind children.

4.2.2 Experimental Design of Liyuan Town's Left-Behind Children's Activity Center

4.2.2.1 Purpose

The second design experiment follows the first experimental study, which is still slightly homogenous in terms of spatial function due to the limited area of the first design experiment. The second experiment focuses on meeting the needs of the left-behind children in addition to exploring the completeness of the spatial function. Find the space function more suitable for left-behind children.

4.2.2.2 Conceptual Design and Results

(1) Project Overview

The project is in the northwestern part of Hunan Province, in Sangzhi County. The county is about 60 kilometers from the city and in the Wuling Mountains. The county belongs to mountainous terrain; the territory is mountainous, and the terrain is complex. The project building covers an area of about 2,000 square meters with a three-story building. The program is mainly focused on rural left-behind children, addressing specific rural social needs and strengthening the relationship between left-behind groups of children. Activity Center, in terms of functional partitioning, is mainly divided into a learning area, entertainment area, social area, science training area, boarding area, office area, and logistics area.

(2) Conceptual Design

The second design experiment focuses on spatial function research to determine the functions and positioning of different activity areas to meet the various needs of left-behind children. Physical and mental health, educational, and recreational needs are taken as the primary considerations, and spatial diversity, interactivity, and flexibility are considered as much as possible during the design process to improve the participation and satisfaction of left-behind children. The study of spatial functions can also optimize the spatial structure of activity centers for left-behind children so that different activity areas can be combined more to maximize the overall functions.

Spatial function division: This is a three-story space building with four entrances, with the main entrance on the right (Figure 72—75). The organization of the floor plan mainly places the areas close to the degree of motion and static together to avoid the cross-influence of motion and static areas. The layout is reasonably arranged so that the primary and secondary relationships of the space complement each other, and the static and dynamic relationships are in their place. Unity is pursued through primary, secondary, and virtual unity, balance and stability, rhythm and rhyme, proportion and scale, indoor and outdoor, functionality, and artistry.

Figure 72 General plan

Source: Design by author, 2023

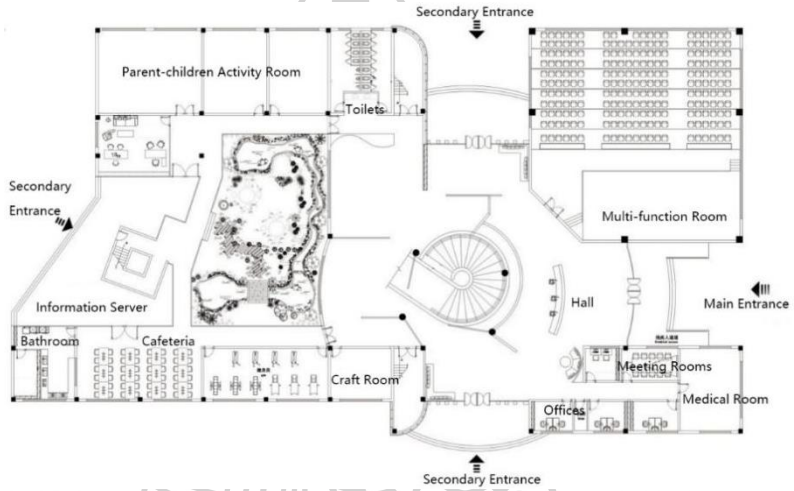


Figure 73 1st floor plan

Source: Design by author, 2023

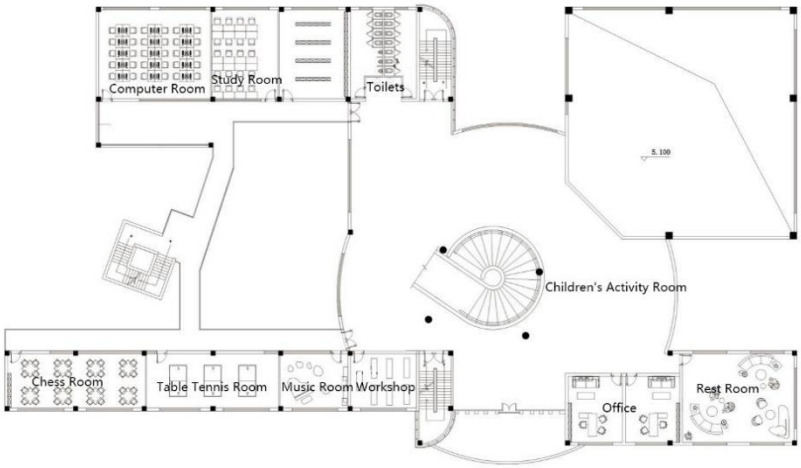


Figure 74 2st floor plan

Source: Design by author, 2023

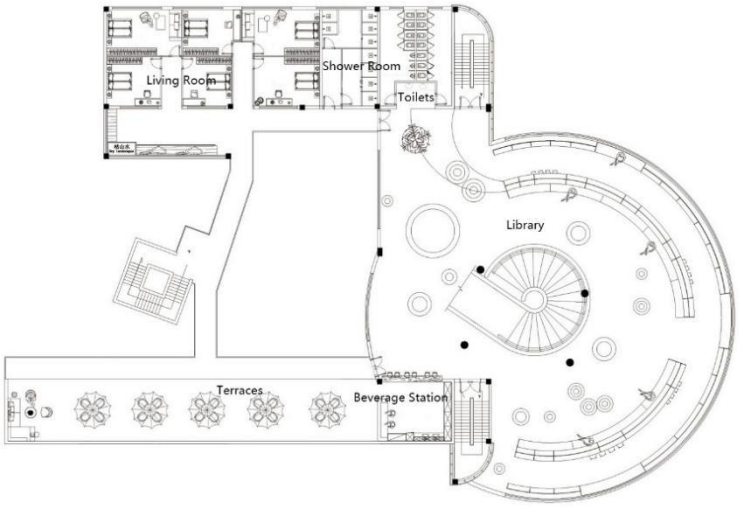


Figure 75 3st floor plan

Source: Design by author, 2023

From the perspective of human flow lines, the various functional blocks in the room, divided from the emotional level, can be divided into four primary levels: quiet areas and mainly boarding areas. Quieter areas are study areas and office logistics areas. Noisier areas: parent-child interaction area and science training area. Noisy areas: recreational areas and social areas (Figure 76, 77).

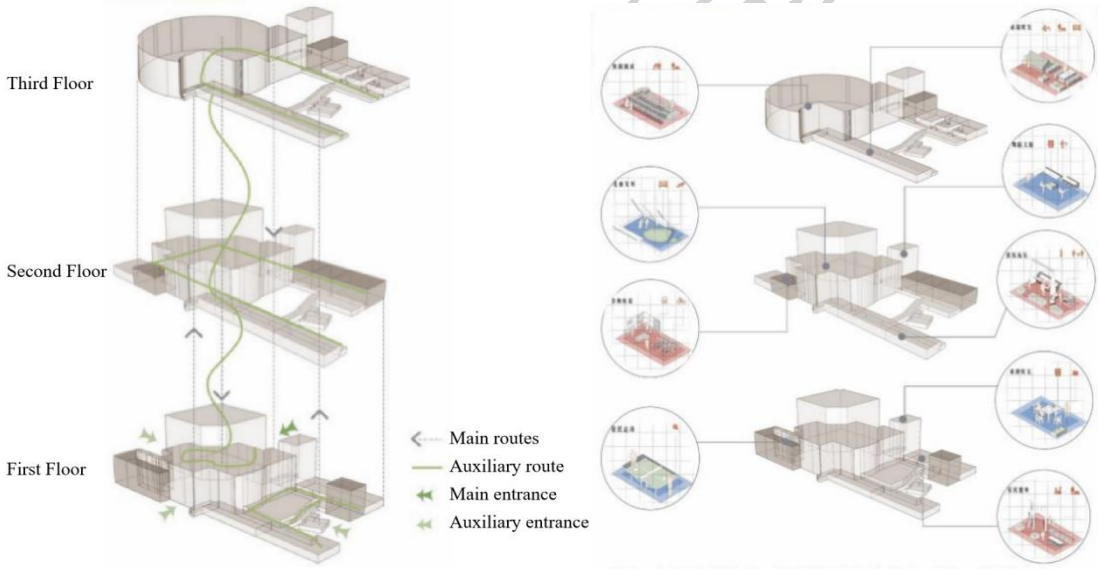


Figure 76 Spatial flow diagram

Source: Design by author, 2023

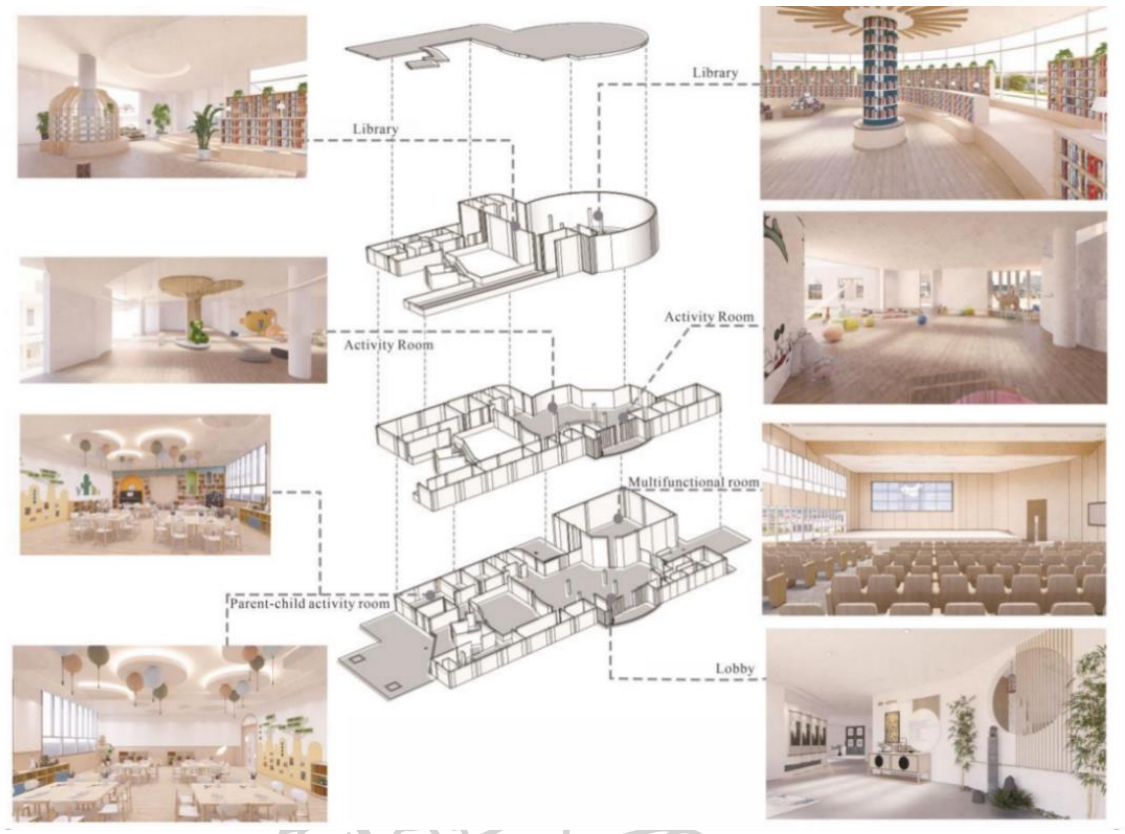


Figure 77 Schematic of each functional space

Source: Design by author, 2023

The design space function covers the following main categories: first, learning aids, such as study rooms and data rooms; second, knowledge expansion, such as extracurricular reading rooms, multimedia learning rooms, and Internet classes; third, family interaction, video calls, parent-child space; fourth, entertainment, film and television appreciation, indoor games; fifth, social needs, team activities, discussion space; sixth, safety protection, self-protection lecture hall, boarding center (Table 16).

Table 16 Main functions of the activity center for children left behind in villages

Functional areas	**Type of activity**	**Functional space composition**
Study area	Self-study, tutoring, reading	Study room, library, computer room
Recreational areas	Film and television appreciation, multimedia learning, indoor games, web surfing, online classes	Computer room, activity room, multi-purpose room, fitness room, table tennis room, music room,
Parent-child interaction room	Parent-child space	Parent-child activity room, craft room,
Social area	Group activities, discussion spaces	Activity room
Science training area	Lectures on art, technology, culture, safety, legal literacy	Lobby, exhibition hall, multi-purpose hall
Boarding area	Living, boarding	Lounge, shower room, toilet
Office logistics area	Office, conference, storage, logistics	Lobby, office, conference room, storage, kitchen, sanitary room
Outdoor activity areas	Gatherings, leisure, games, sports	Courtyards, squares

4.2.2.3 Summary

Based on preliminary study findings, the researcher separated the functions of the left-behind children's activity center and defined the unique role of each functional area, allowing different places to satisfy the various demands of the left-behind children. However, some areas need better thought out in the specific implementation process.

4.2.2.4 Expert Assessment Opinions

The experts evaluated Option 1 and the results are shown in Table 17.

Table 17 Experiment 2 expert advice

Evaluation Indicators	**Expert Recommendations**
Functional Layout of Space	Clear layout
Child Safety	Safety is better
Satisfaction of Demand	The needs of left-behind
Degree	Ensure that the space is functional and versatile, suggest additional design elements for children's participation.
Space Aesthetics	The space is aesthetically pleasing, but it is recommended to consider local cultural elements in terms of color, material and shape

4.2.3 Design requirements Based on the Experimental Summary

4.2.3.1 Design Elements of the Event Center

Based on the findings of the two experiments, the critical cultural messages and design elements that provide valuable information for the design of the activity center for left-behind children are derived and summarized (Figure 78).

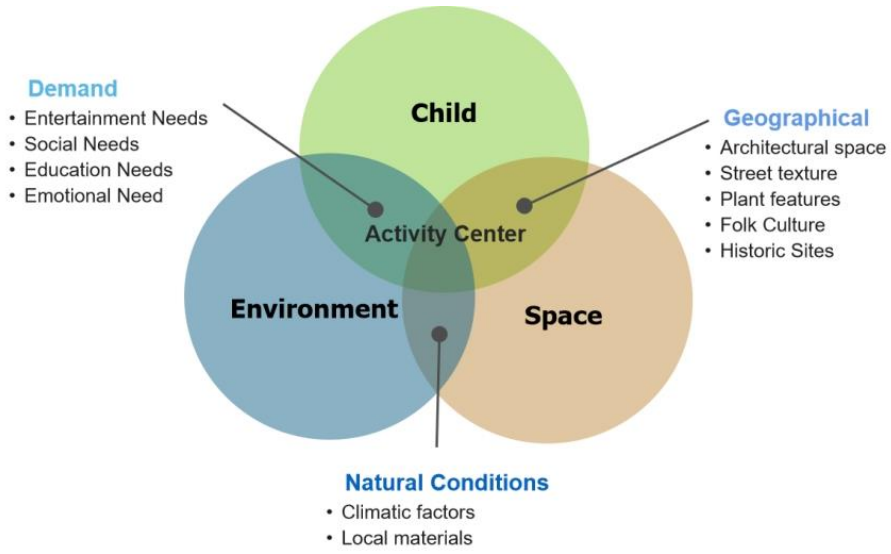


Figure 78 Design components of the left-behind children's activity center

Source: Self-drawn by the author, 2022

The primary considerations in the design conceptualization process are the relationship between the left-behind children, the environment, and the space, as these three have a vital role in the design of the children's activity center.

First of all, the children left behind are an essential consideration in the design of the activity center. The designer needs to understand their characteristics, needs, and interests so that the actual situation can be considered in the design.

Secondly, the environment is also one of the factors to be considered in the design of activity centers. Environmental factors include the surrounding natural environment, human environment, traffic conditions, and climate. Designers must choose suitable building materials and shapes according to different natural environments and regional characteristics to create a suitable activity space for left-behind children.

Finally, space is also an essential consideration in the design process. The regional culture should be mainly introduced in the architectural and interior design to blend the building with the local environment and culture. At the same time, the space in different areas should be reasonably allocated to create a comfortable, safe, and pleasant environment.

Therefore, as in Figure 78, the relationship between children, environment, and space is interrelated and influenced by each other in the activity center design. Only when the relationship between these three is fully considered can we design an activity center that genuinely meets the needs of left-behind children.

4.2.3.2 Design Principles

The design principles of regional left-behind children's activity centers are obtained through research and analysis, design experiments, expert consultation, and referring to other project methods.

The needs and characteristics of Hunan regional left-behind children are investigated and analyzed through research, analysis, and design experiments. Experiments are designed to determine the design principles' primary direction and critical content. By consulting relevant experts, obtain their experience and suggestions in design, and determine the specific content and implementation of design principles. By referring to the design experience and successful cases of similar projects, we can obtain inspiration and references and improve the feasibility and practicality of design principles. Finally, the relevant content of the design principles is summarized (Table 18).

Table 18 Comparison table of design principles

Design principles	Content Overview
Child-centered	The design should be child-centered, in line with children's needs and psychological characteristics.
Regional cultural integration	The design should respect and reflect the cultural characteristics of the Hunan region and the rural landscape.
Innovativeness	The design should be innovative and forward-looking, reflecting novel design concepts and technical means.
Practicality	To satisfy practical usage requirements, the design should be realistic and workable.
Sustainability	Environmental protection and sustainable development should be considered in the design.

4.2.3.3 Design Flow Chart

The design elements were integrated based on the relevant, valuable information and design elements from the preliminary research and the design principles. A design flow chart was drawn up (Figure 79).

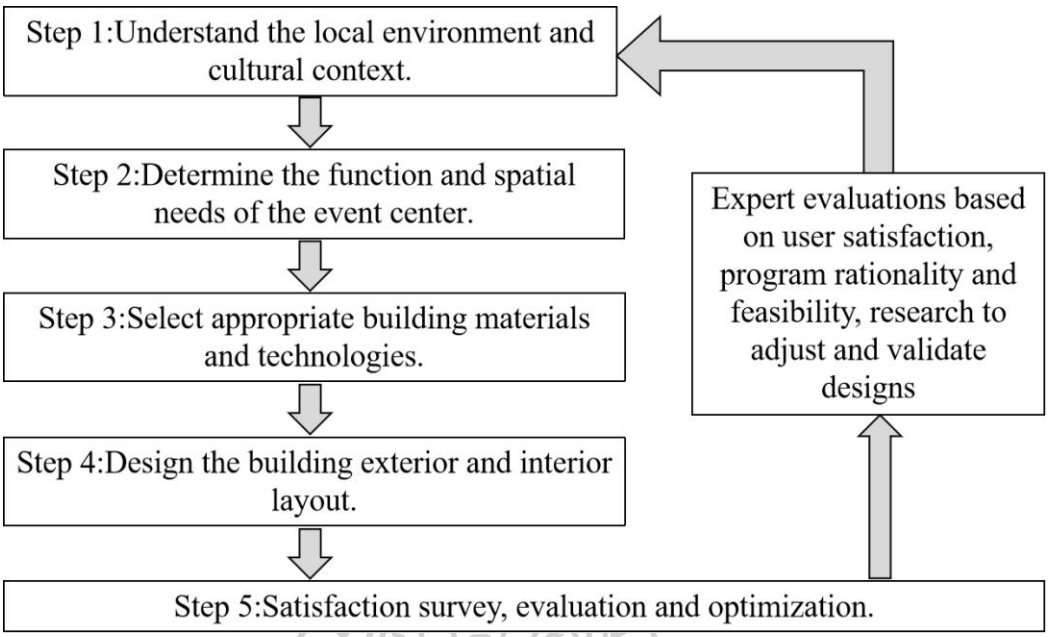


Figure 79 Design flow chart

Source: Self-drawn by the author, 2022

The procedures for designing an activity center for left-behind children in rural regions are as follows:

Step 1: Learn about the local nature and culture. Before design, a thorough understanding of the local environment and cultural context, including topography, climate, and folk culture, is required. It can assist researchers in better comprehending the local social and cultural backdrop and provide creative inspiration.

Step 2: Determine the functional and spatial requirements of the activity center. The functional requirements of the activity center are the focus of the design, which should meet the activity needs of the left-behind children and consider safety and education. On this basis, the researcher needs to determine the spatial requirements of the activity center, such as the distribution of indoor and outdoor spaces and the size of the rooms.

Step 3: Choose suitable building materials and techniques. To ensure the safety and comfort of an event center, appropriate construction materials and technologies need to be selected, such as environmentally friendly materials and improved sound insulation. Local climate and environmental factors must be considered when choosing materials and techniques.

Step 4: Design the exterior and interior layout of the building. Based on the function and space requirements of the activity center, the designer needs to design the exterior and interior layout of the building to ensure that the activities of left-behind children can be effectively organized and managed. At the same time, the aesthetic value of the building needs to be considered to attract and stimulate the participation and learning of left-behind children.

Step 5: Satisfaction Survey, Evaluation, and Optimization.

4.2.4 Design Methodology

According to the design elements, design principles, and design process of the activity center for left-behind children in Hunan Province, the design method of the activity center for left-behind children was summarized (Figure 80).

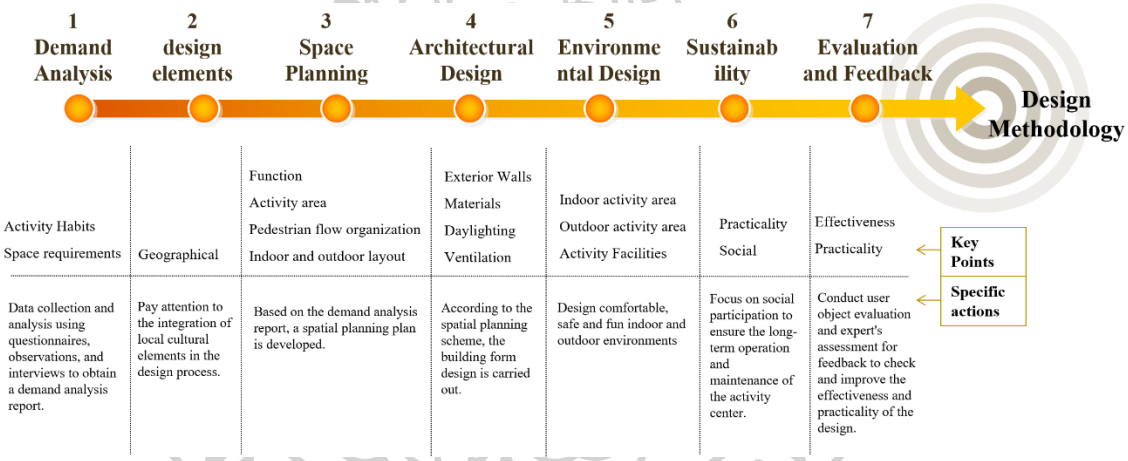


Figure 80 Design Methodology Framework Diagram

Source: Self-drawn by the author, 2022

Methodology Specified:

4.2.4.1 Needs Analysis

Collect social, cultural, psychological, and physical data on left-behind children and analyze their needs, including their activity habits and space needs. Use questionnaires and interviews to collect and analyze data and get the demand analysis report.

4.2.4.2 Design Elements

In the design process, attention was paid to integrating local cultural elements so that the left-behind children could feel the cultural atmosphere of their hometown in the activity center and enhance their sense of identity and self-esteem.

4.2.4.3 Space Planning

According to the demand analysis report, determine the requirements of the activity center in terms of function, activity area, human flow organization, indoor and outdoor layout, and develop a spatial planning plan.

4.2.4.4 Architectural Design

According to the spatial planning scheme, the architectural form design is carried out, considering building facade design, building height, building materials, color matching, lighting, and ventilation.

4.2.4.5 Environment Design

Design a comfortable, safe, and appealing indoor and outdoor environment for left-behind children, including the division of indoor and outdoor activity zones and the placement of activity facilities based on their psychological qualities and activity demands.

4.2.4.6 Sustainability

In the design process, attention is paid to sustainable design and social participation, including communication and cooperation with residents and parents of left-behind children, to ensure the practicality and sociality of the design and the long-term operation and maintenance of the building.

4.2.4.7 Evaluation and Feedback

User object evaluation and expert evaluation of the design solutions and feedback are conducted to check and improve the effectiveness and practicality of the design.

4.2.5 Expert Evaluation Criteria

In the evaluation, experts use a four-dimensional expert evaluation approach. Attention should be given to the four aspects of children's needs: degree of conformity to needs, design solutions, Regionality, practicability and sustainability in designing activity centers for left-behind children. A four-dimensional expert

evaluation system is designed according to the design methodology and experts' suggestions (Figure 81).

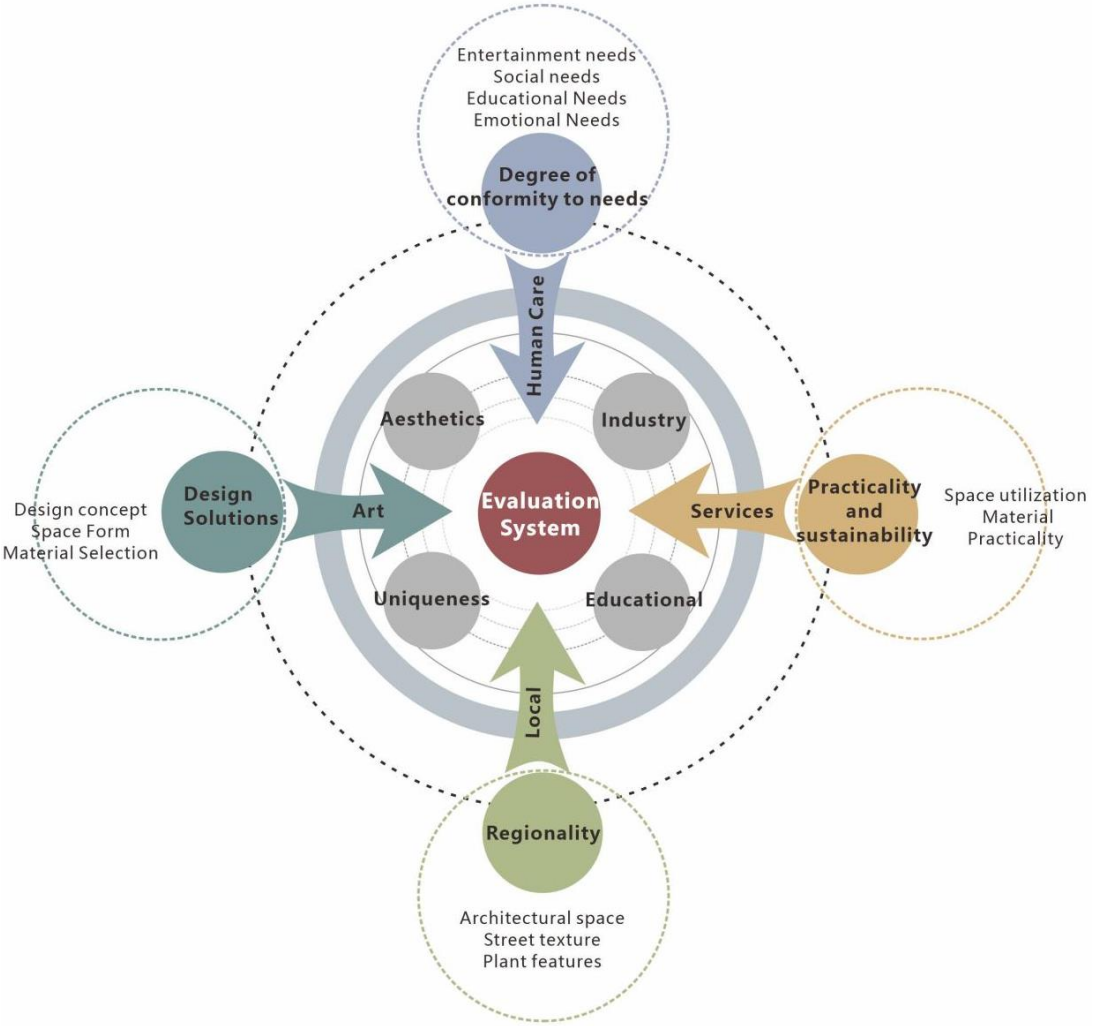


Figure 81 Four-dimensional expert evaluation system

Source: Self-drawn by the author, 2022

According to the above evaluation system, a quantitative table of evaluation criteria is developed (Table 19), in which each aspect can be rated from 0 to 10 by experts. The final assessment findings may then be determined by computing the expert rating index, which is denoted by the formula 4W = (Np-Nd)/Np, where 4W refers to the four-dimensional evaluation method, Np refers to the number of evaluation experts, and Nd refers to the number of experts who offer the highest score.

Table 19 Four-dimensional expert evaluation criteria quantification table

Evaluation code	Evaluation criteria	Description
A	Degree of conformity to demand	Assess the extent to which the design solution meets the needs of the children left behind and the degree to which it meets those needs, including consideration of space, function, facilities.
B	Design Solutions	Assesses the degree of innovation and uniqueness of the design scheme, including innovation in design concept, spatial form and choice of materials.
C	Regionality	Assesses the extent to which the design scheme incorporates the regional culture and natural environment of Hunan, including consideration of local history, culture and architectural traditions.
D	Practicality and sustainability	Assessment of the practicality and sustainability of the design solution, including consideration of space efficiency, energy use, environmental protection and sustainability.

4.3 The Design Practice of the Activity Center for Left-Behind Children in Qinglin Township

4.3.1 Purpose

This practice is based on the summary of the first two experiments, adopts the expert's suggestions, and uses the summarized design methodology in practice. The third design approach begins with the requirements of left-behind children and regional culture to provide an activity space for children that fits their needs in all aspects while stressing the inheritance and development of local culture. The third design practice verifies the scientific and feasibility of its design methodology.

4.3.2 Design Overview

4.3.2.1 Location Overview

Cailin Village, Qinglin Township, Changde City, Hunan Province, has a relatively flat topography and a subtropical monsoon climate with four seasons, abundant rainfall, and an appropriate temperature. This village is a small grassroots natural village with a long history of suitable climatic conditions and natural resources; natural landscape resources are not reasonably utilized, and economic conditions are backward; it represents the vast majority of ordinary villages in Hunan Province with poor conditions for their resources. The resident population of Cailin village is 1,940 people, and there is one elementary school in the village with more than 150 students. Due to the lack of transportation, the village has developed slowly but has preserved its traditional appearance and native natural resources (Figure 82).

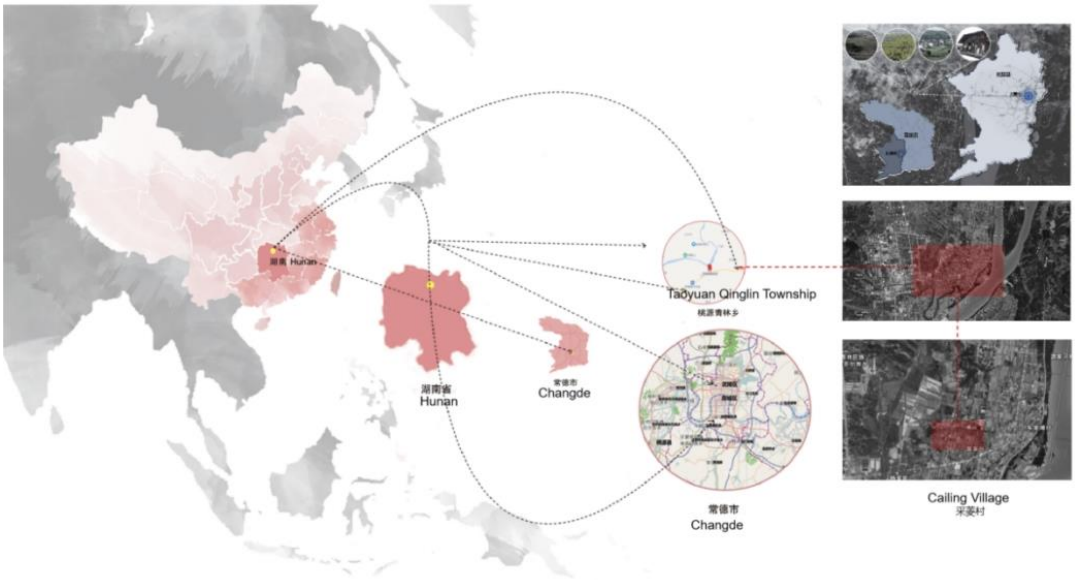


Figure 82 Project location map

Source: Self-drawn by the author, 2023

4.3.2.2 Site Selection

The selected design site is in the northeast direction of Cailin Village in Qinglin Township. The current situation is mainly agricultural land, beside the residential buildings and the main road in the village, surrounded by a vast paddy field and pond, with the village office in the northwest and the elementary school in the

village in the northeast, surrounded by hilly and plain terrain with abundant natural resources.

The total area of the design scope is about 2400m^2, and the building covers 872m^2. The site's overall topography is relatively flat, the terrain decreases gradually from the northwest and southeast to the middle, there is no significant height difference, the surrounding building layout is relatively gathered, and the building form varies mainly between brick and tile buildings. At the same time, there are a small number of earthen buildings (Figure 83).

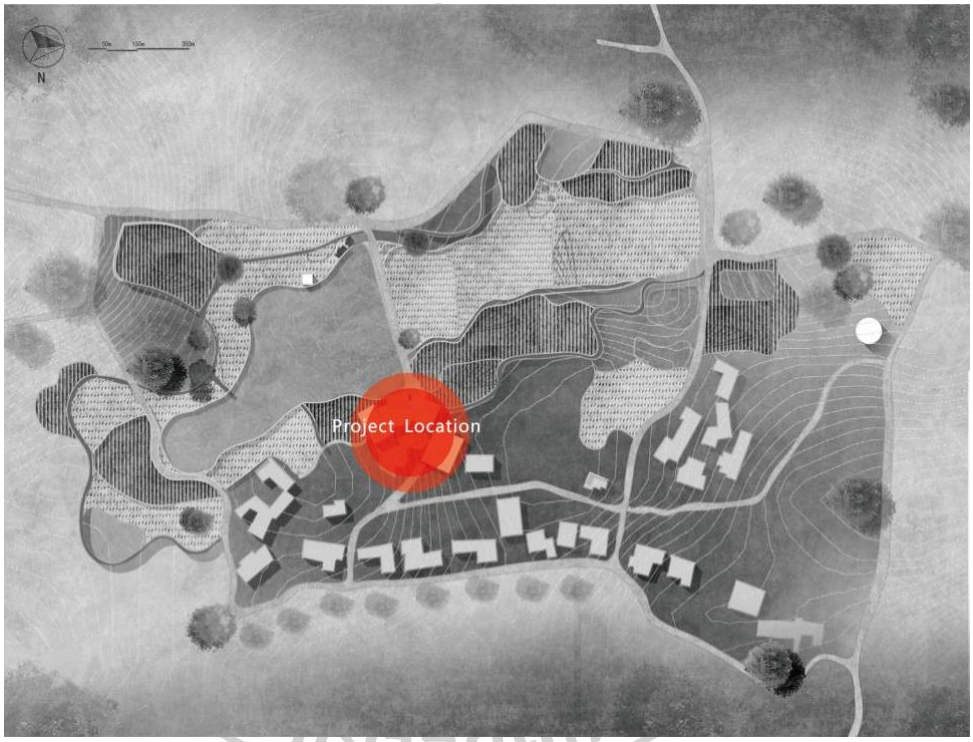


Figure 83 Project site selection map

Source: Self-drawn by the author, 2023

4.3.3 Design Sketch Choices

According to the purpose and requirements, the researcher designed three sets of program sketches for experts to evaluate and score, and finally selected a satisfactory program for deepening.

4.3.3.1 Design Sketch 1

Concept: The building is presented as a single building designed using local wood, bamboo, and stone materials. The design begins with the goal of

satisfying the social and educational requirements of left-behind children. In rural regions, the primary school curriculum must be completed, which can be complemented by an extended curriculum in the activity center. Using the existing activity space, more learning and communication spaces are functionally set up to provide more platforms for knowledge intake through functional composite design, increasing the knowledge of disadvantaged youngsters and closing the educational gap between rural and urban areas (Figure 84).

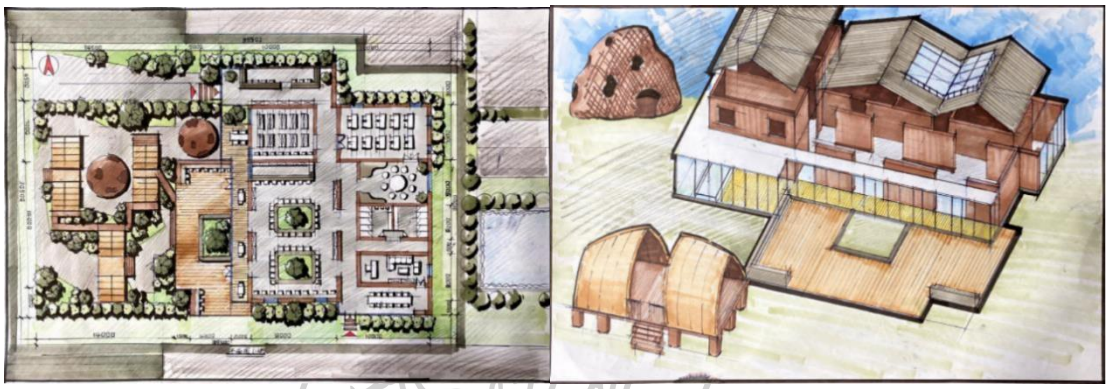


Figure 84 Design sketch 1

Source: Self-drawn by the author, 2023

4.3.3.2 Design Sketch 2

Concept: The building is still presented as a single building, designed with local materials such as wood, bamboo, and stone. The design is inspired by the "womb" of human beings from a safety perspective (Figure 85). The design reflects the safety of the space: it makes the child feel like returning to the mother's womb, safe, comfortable, and unrestrained; freedom: it can be placed freely, making the space flexible and changeable; fun: it can be set individually or put together, which is interesting.

Design more interaction spaces, such as sports, reading, and learning areas, to meet the social needs of rural left-behind children. We may increase parent-child contact between left-behind children and their parents working outside, deepen emotional links, and compensate for the absence of affection for children using Internet technology. In addition to offering a diverse, dynamic environment, a safe and private place for excellent mental health education should be built to comprehend the psychological difficulties of local left-behind children and give prompt treatment.

Figure 85 Design sketch 2

Source: Self-drawn by the author, 2023

4.3.3.3 Design Sketch 3

Concept: Scheme three is optimized based on scheme two. In order to make the scheme more integrated with the surrounding environment, the design changes the building's monolithic scheme into a decentralized building form with more flexible space. The functional design meets the needs of the left-behind children. Unlike the first two schemes, this one mainly sets up a network room for communication with parents regarding emotional needs so that the left-behind children can be emotionally enhanced. The primary materials used in the building are local wood, bamboo, and stone. Combined with the local, regional culture, the concept of "nature education" is implanted, implanting education in the countryside, establishing new learning methods in the natural environment, and integrating local wood carving, embroidery, opera, and other folk activities into the functional curriculum of the activity center so that the functions of the activity center are scattered throughout the village (Figure 86).

Figure 86 Design sketch 3

Source: Self-drawn by the author, 2023

4.3.3.4 Comparison of Design Sketch

For the three design sketches, the researcher consulted seven experts in different fields. The experts were asked to vote on the three options. The voting results were: one expert for design sketch 1, one expert for design sketch 2, and five experts for design sketch 3. Therefore, design sketch 3 was finally selected as the final option presented by the researcher.

4.3.4 Design Element Orientation

4.3.4.1 In the spatial layout, different activity areas, such as play areas, reading areas, and study areas, should be set according to the needs of left-behind children.

4.3.4.2 The appearance and interior decoration reflect the elements of Hunan regional culture, such as Hunan traditional residential architecture, handicrafts, and folk art. The concept of "nature education" is implanted, new learning methods are established in the natural environment, and the curriculum of folk art is integrated so that the functions of the activity center are scattered in all parts of the village. This adds a sense of place to the building and allows the left-behind children to understand and appreciate Hunan's regional culture.

4.3.4.3 Five design suggestions from Climate Consultant were used as design references.

4.3.4.4 Choose local characteristics, such as rammed earth, stone, wood, and bamboo, in Hunan, reflecting the characteristics of the Hunan region in the architectural design and giving the building a more regional sense.

4.3.4.5 Consider environmental protection, energy savings, and sustainable development during design. Use green building materials and technical equipment to decrease the ecological effect while increasing the building's practicality and economics.

Through the above design elements' positioning, the rational use of these elements will eventually provide a safe, comfortable, and regionally characteristic activity center for left-behind children.

4.3.5 Space Planning

4.3.5.1 General Plan

The activity center is mainly for entertainment, socialization, education, and emotional enhancement. It is an open activity center for children abandoned in rural locations, with the notion of "nature education" incorporated.

The program is designed to meet the physiological, psychological, and behavioral needs of middle-aged children, as well as the needs of adult caregivers; secondly, to enable the left-behind children to get closer to nature more directly, the concept of "nature education" is implanted, and the activity site is combined with the current farmland. The purpose of this design is to introduce children to the natural space to create a spacious environment for children in Cailin Village to play, socialize, and learn, and also to meet the needs of guardians to rest, as well as meet the needs of multi-age people's activities, which may not only accomplish the impacts of education and entertainment but also serve an advantageous part in children's physical and mental health.

The general planning design is shown in Figure 87. The location of the activity center for left-behind children is in area 4, and the remaining areas are: 1 is the village entrance, 2 is the tower, 3 is the village committee, and 5 is the elementary school of the village.

Figure 87 General plan

Source: Design by author, 2023

4.3.5.2 Traffic Route Analysis

The site of the activity center is moderate in size, significant in space, and open, so there are four entrances and exits planned on the site: two main roads and two secondary roads. The main entrances and exits are set in the direction of the village committee, the school, and the lake.

A 5 meters wide main road connects the four functional areas in series, followed by a 3 meters wide secondary road separating the other spaces to facilitate walking. All the roads are barrier-free, the flow of the site is simple and smooth, and it is conducive to the guardians taking care of the children, reflecting the human-oriented, humanized design (Figure 88).

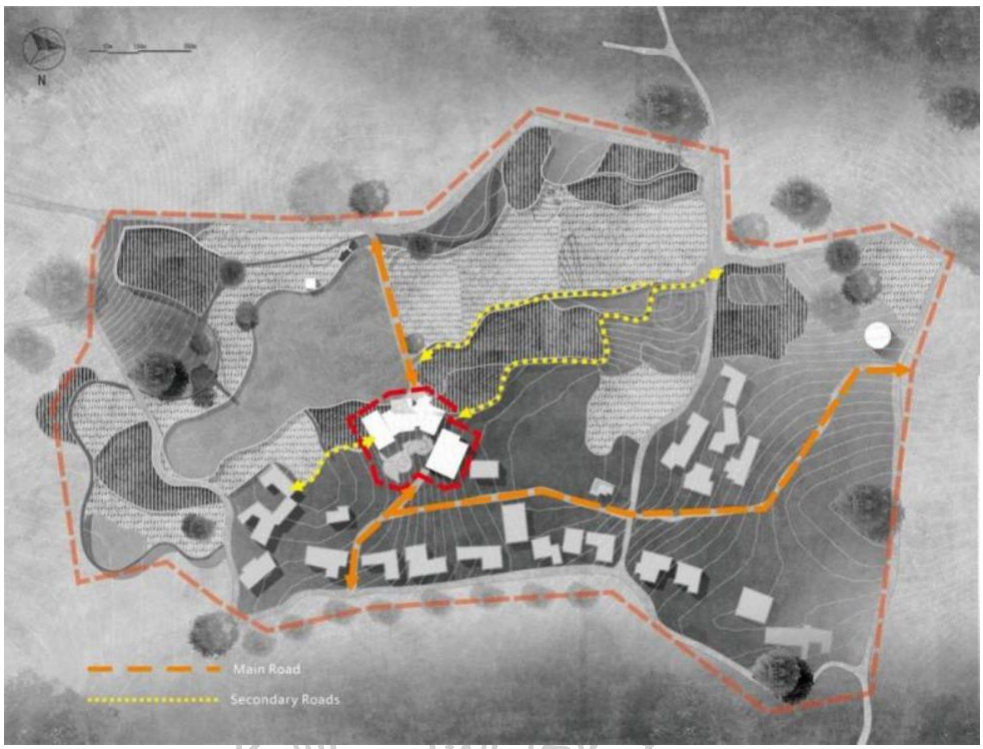


Figure 88 Traffic route analysis map

Source: Design by author, 2023

4.3.5.3 Functional Zoning

Based on the preliminary research of the site and the analysis of the psychological behavior of left-behind children, each activity space is reasonably laid out to create a natural and exciting activity space, and the whole space forms a structure of "one core + five areas," (Figure 89).

One core: The activity center for left-behind children is located at the center of the activity space for children in the village, meeting the needs of entertainment, socialization, education, and emotion and giving other functions to the site around the core.

Five zones: The researcher included the area around the activity center in the natural educational activities for left-behind children, bounded by the red line in Figure 86. The five zones are the village entrance activity zone, nature education zone, agricultural experience zone, activity center zone, and lawn theater zone.

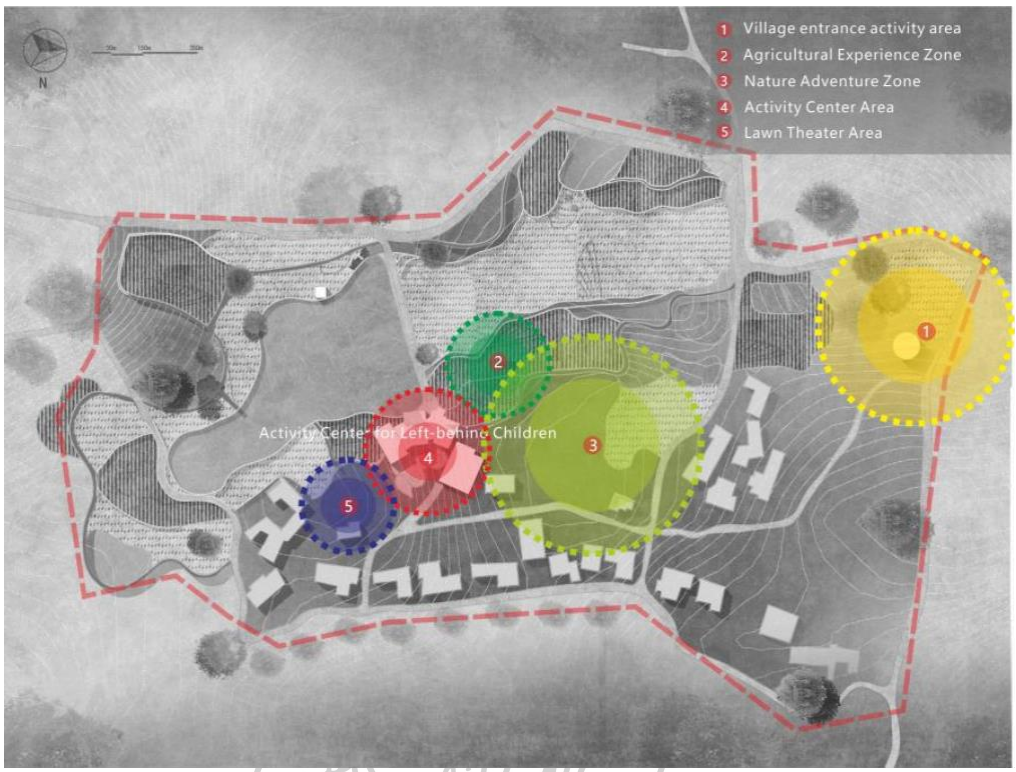


Figure 89 Functional zoning map

Source: Design by author, 2023

(1) Activity Area at the Entrance of the Village

The village entrance area is presented in an open form, respecting the site's current situation in terms of natural and flat terrain. It has both the functions of staying, resting, and socializing, and it can also meet the recreational and emotional needs of left-behind children.

A 6 meters high tower is designed at the village's entrance, with a view of the village and beyond. This tower is named "Hope Tower," a spiritual symbol and pillar for the left-behind children to look forward to their parents' return home. The tower's interior is a single-run rotating staircase with a width of 1.5m. The central part of the staircase is made of a cement-poured foundation, which supports the staircase surface and is decorated with many light wood and bamboo materials. The branches support and expand upward, representing the mutual contact between the children on the left and their distant parents. The branch-like structure signifies the desire to return, meaning the powerful feeling of coming home (Figure 90).

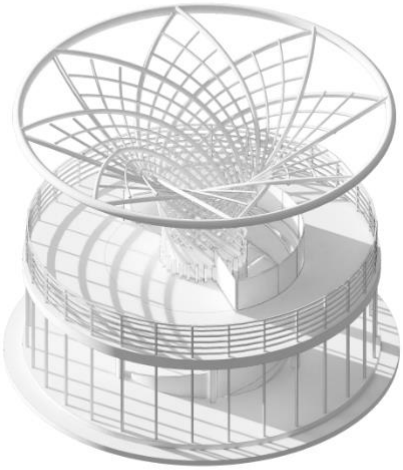


Figure 90 The "Hope Tower" at the entrance of the village

Source: Design by author, 2023

(2) Nature Education Area

The natural adventure area is located in the open farmland next to the activity center, and the original shape of the site is the original ecological terraces with local woods. In order to maintain the ecology of the site, the nature of the original site will not be changed. Therefore, the "nature education" curriculum is integrated into the original foundation, such as observation classes, adventure classes, survival classes, and so on. It is a space for left-behind children to connect with nature and integrate into the natural environment to exercise their learning spirit and creativity fully.

(3) Agricultural Experience Area

In this space, left-behind children can experience growing vegetables and flowers, playing hide-and-seek in the plant maze, and getting to know plants.

(4) Activity Center Area

The activity center area is located at the center of the whole space, as shown in Figure 91, and the main functions of the left-behind children's activity center are reflected in this area. It is divided into indoor and outdoor parts.

Figure 91 Activity Center Area Planning Map

Source: Design by author, 2023

The functions of the indoor part are an interactive area, a social area, a science room, a library, an office, a multi-function room, and a boarding area.

The functions of the outdoor section are outdoor, seesaw, sandpit, swing, and secret base.

(5) Lawn Theater Area

The lawn theater is based on the original terraces, and wooden bars are set at the edge of the terraces. The whole space is in the form of steps placed at the edge of the terraces, with open space that can meet various functions of left-behind children, such as activities, group games, villagers' gatherings, sunbathing, and resting.

4.3.6 Architectural Design

4.3.6.1 Architectural Development

The site's original buildings are located on the east and west sides, respectively. The east side is an abandoned private house, and the west is the original activity house for left-behind children, whose structure and functions are relatively simple, with only a psychological counseling room, library, and activity room. It is

closed most of the time, only used by volunteers for voluntary counseling and teaching, and occasionally opened for children who borrow books.

The building generation of the activity center for left-behind children is shown in Figure 92, which is divided into nine steps as follows.

(1) Original plot: There are two original buildings on the site, the abandoned house facing the lake and a house for left-behind children at the back, and there is a 2-meter height difference between the two blocks.

(2) The new plot is connected to the original plot: a new building is added in the middle of the two original buildings to connect them. The blocks are located on the terrace with a 2-meter height difference.

(3) Reconstruction of the original building block: The original abandoned house is transformed into a shared children's public activity area. The children's home behind it is a living area for left-behind children.

(4) Blocking of the new building: Two additional blocks are added in the middle: a science activity space, a multi-functional area, and an office area.

(5) New building block division: The new block is divided into three different spaces linked by a platform, forming a transportation space in the middle.

(6) Building facade division: The building facade materials are wood and red brick, dividing the boundary of the two materials.

(7) Generation of each building block: Four major blocks generate corresponding functional areas. The three buildings are more closely linked, and the living area behind them is relatively hidden and independent.

(8) Sloped roof generation: The roof is designed as a sloped roof according to height difference and drainage convenience.

(9) Overall building flow schematic: Three primary and secondary site entrances are set.

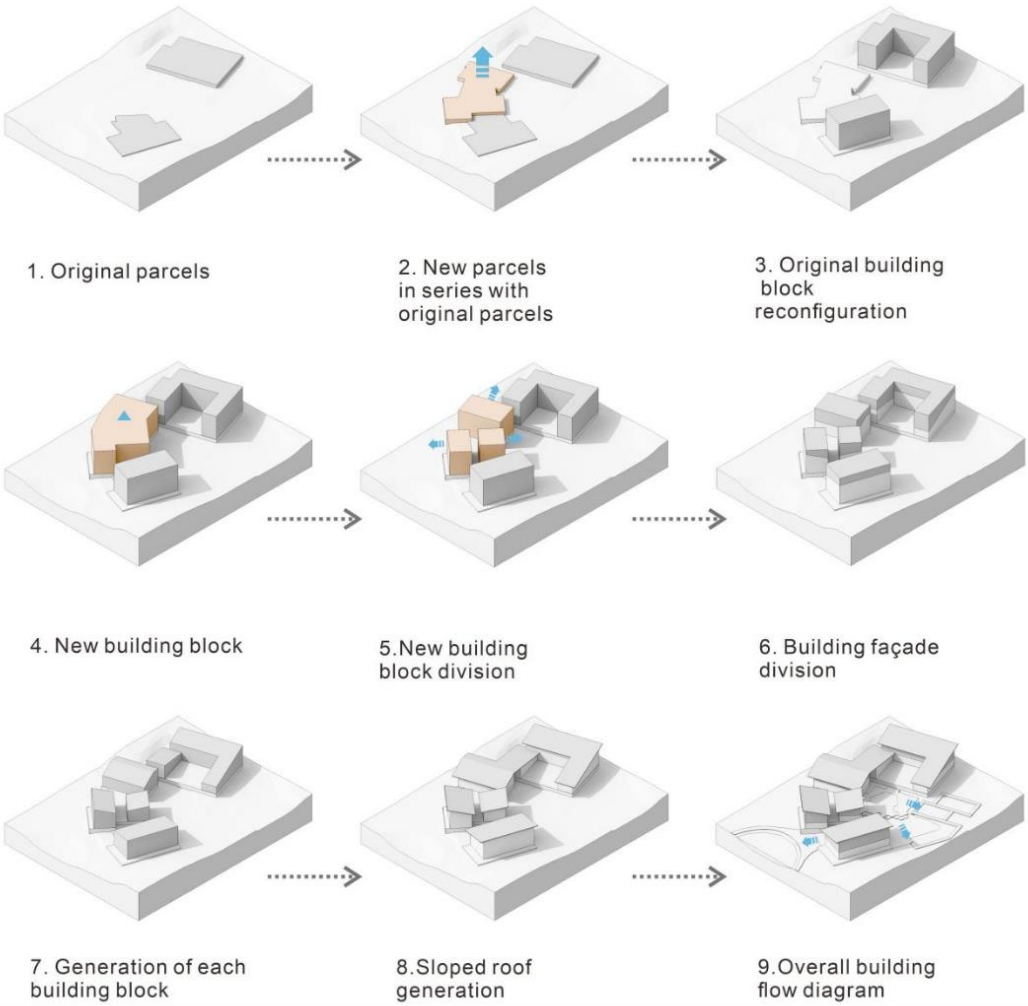


Figure 92 Architectural development process diagram

Source: Design by author, 2023

The researcher analyzed the original building blocks and added appropriate ones for more spatial functions. The original left-behind children's activity center was renovated, and the main body of the "emotion box" was set up to allow face-to-face connection between left-behind children and their parents over the Internet and serve as an emotional needs center. The main body of the building, with a courtyard, is formed through the addition and is mainly a space for games, interaction, and education. The four blocks are connected by a corridor, forming a unified building block that can be opened and used separately.

4.3.6.2 Building Lighting Design

The direction of light was considered in the design to maximize the use of natural light, and windows facing south were chosen to allow more sunlight to enter the room while also meeting the requirements of ventilation.

According to the parameters of the sun diagram and shade diagram calculated by the climate consultant, the light of the activity center is analyzed. Yellow represents sunlight, a red circle represents the activity area, and blue represents the relationship between the building and the activity area (Figure 93).

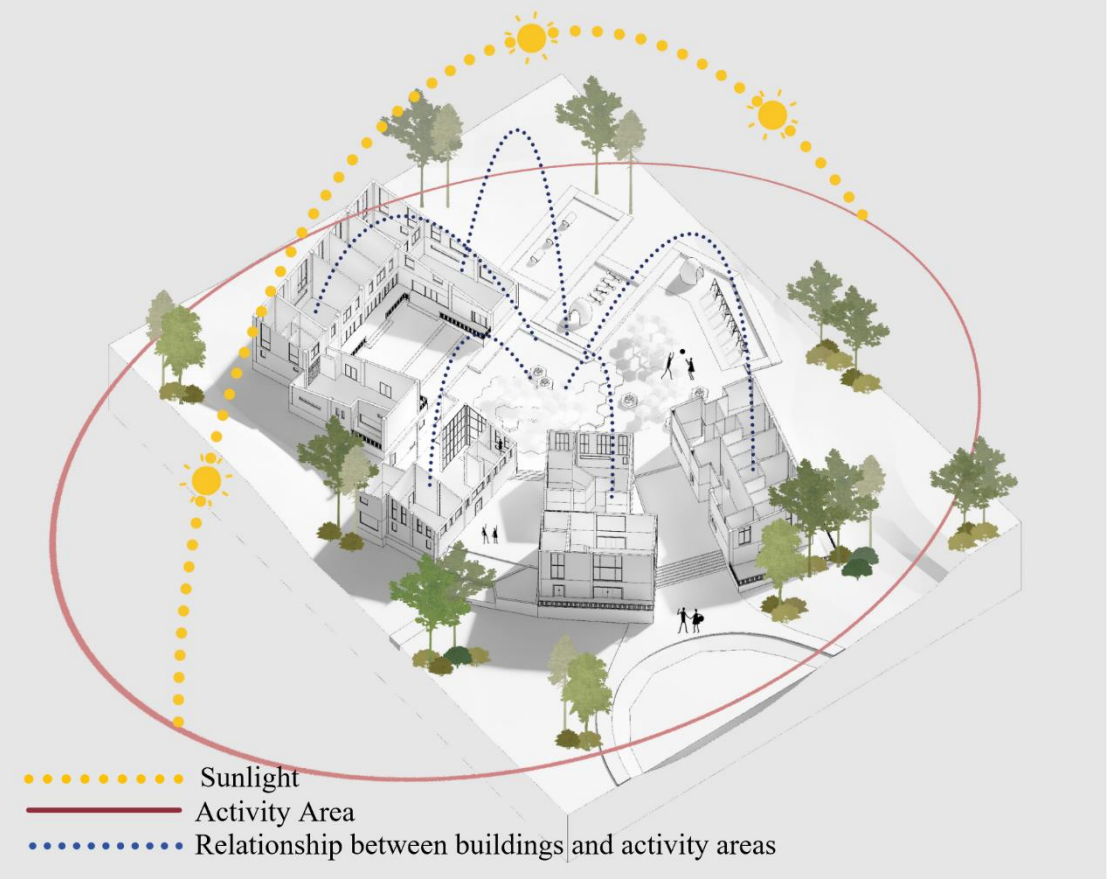


Figure 93 Daylighting design drawing

Source: Self-drawn by the author, 2023

4.3.6.3 Architectural Design

The form of building is formed to stagger the existing local ancient villages through the changes in the layers of the four blocks. Considering that the building as a public service facility should be simple and modest, there is no overly exaggerated architectural volume and shape expression (Figure 94).

First, in the spatial layout, different activity areas are designed considering the different ages and interests of the left-behind children. The functional sections, such as the social, study, and rest areas, are suitably organized so that the entire activity center is completely functioning and can fulfill the requirements of children left behind. Special consideration should be given to the protection of children throughout the design process, and protective measures and monitoring facilities should be established to safeguard the physical and emotional safety of left-behind children.

Secondly, in terms of building materials and technology, considering the climate and environment of Hunan, building materials that meet the characteristics of the local climate are selected, and natural and indigenous materials are used as much as possible to present architectural expressions. The researcher extracts and translates characteristic building materials from local traditional architecture—wood, bamboo, green bricks, red bricks, and earth—as necessary building façade materials. Using many native raw materials can balance the temperature difference and improve space comfort. A rustic atmosphere is conveyed through simple masonry, while steel and glass materials are also used. The design also considers local architectural traditions and cultural elements.

Finally, the aesthetic and artistic components emphasize the design's creativity and uniqueness while also taking into account the aesthetics of the building so that the children who are left behind may grow up in a beautiful setting. The whole activity center's design meets practicality, artistry, and aesthetics, thus providing a comfortable, safe, exciting, and beautiful activity place for left-behind children.

Figure 94 Building exterior design drawings

Source: Design by author, 2023

4.3.7 Environmental Design

4.3.7.1 Outdoor Environment Design

The conclusion of the behavioral activities of the left-behind children was summarized from the questionnaire and observation method. The researchers used this conclusion to set up games that children love to play, which can bring them endless joy and meet their needs in the limited outdoor space of the activity center using the most primitive materials.

There is a sandpit, a secret base, a swing, a seesaw, a wooden pier, and other facilities for children to play there (Figure 95).

In the design, the leisure and social needs of left-behind children and guardians (such as single parents or the elderly) are also considered. The games, leisure, and social functions are combined on the limited site, with pavilions and seats for rest and companionship. Some colorful and interesting devices are set up to serve as decoration and a place for rest and communication. Adequate socialization can promote communication and interaction between children, villagers, their partners, neighbors, and relatives; thus, left-behind children's healthy psychological development is promoted.

The bamboo pavilion is erected using basic building methods for the left-behind children's guardians to converse and rest, making the place more fascinating for youngsters while reflecting the qualities of the countryside.

Figure 95 Outdoor environment design drawings

Source: Design by author, 2023

4.3.7.2 Interior Design

(1) Indoor Functional Division

According to the demands, the space is placed in public and private areas according to the needs of left-behind children. The public area is mainly for children's game interaction, socialization, science popularization, interest cultivation, and other areas. The private area includes functions such as children's reading, studying, and living (Figure 96).

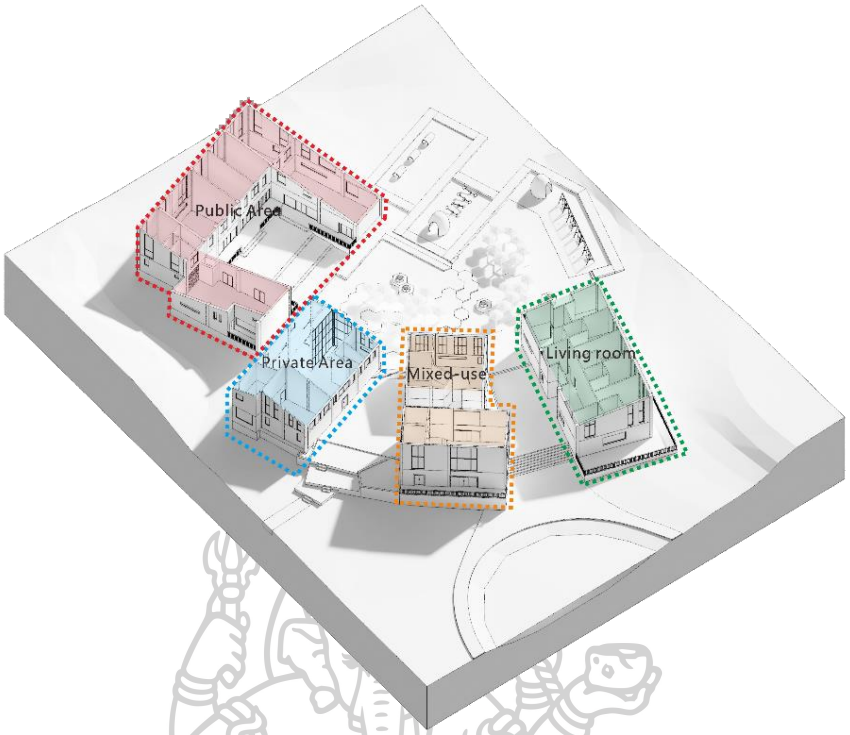


Figure 96 Indoor dynamic and static analysis diagram

Source: Design by author, 2023

The interior space consists of four buildings, and all four blocks have passages connected to the outdoors using light and ventilation (Figure 97).

Figure 97 Interior floor plan

Source: Design by author, 2023

From left to right, the first building is the public area. The functions of the indoor space are parent-child interaction area, parent-child communication area, psychological counseling room, socialization area, science room, storage area, and toilet. It serves as a space for children's interests and activities and caters to children with different needs. Among them, the parent-child exchange area and psychological counseling room satisfy the function of alleviating the psychological problems of left-behind children.

The second building is a private area. The interior spaces function as a library, study room, book storage, and toilet.

The third building is mixed-use. The interior spaces function as a multipurpose room, office complex, office, and monitoring room. A connecting corridor connects the office and activity spaces.

The fourth building is the living room. The interior space functions are sleeping, communication, and storage areas.

For example, the correspondence connection between the demands of left-behind children and the activity center's primary space (Figure 98)

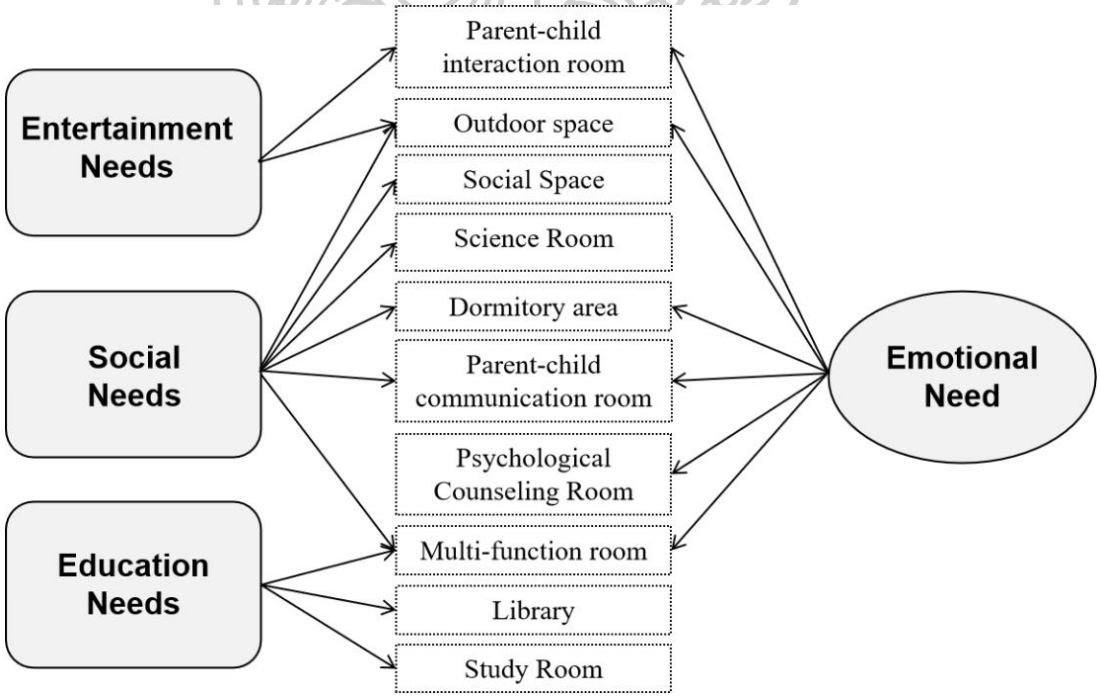


Figure 98 Correspondence between demand and space

Source: Self-drawn by the author, 2023

(2) Analysis of Social Area Space

This venue primarily serves the social interaction requirements of left-behind children. Children may create a social space for active communication through group games to gain a sense of accomplishment and alleviate the shortage of communication and interaction among rural left-behind children.

Its activities take the form of games with therapeutic effects, for example, role-playing, drama performance, and watching movies, to meet children's needs for space and activities and develop social behaviors, so that rural left-behind children can gradually recover in their psychological and behavioral performance and thus overcome psychological barriers (Figure 99).

Figure 99 Social area design drawings

Source: Design by author, 2023

(3) Parent-Child Communication area

The parent-child communication area is set up next to the counseling room in the first building, "Emotion Box," so that children and their parents can communicate face-to-face through the Internet and assume the function of emotional needs (Figure 100). The space is reasonably self-contained, and communication with parents in the city via network connection serves the emotional requirements of children who are separated from their parents and alleviates psychological difficulties.

Figure 100 Parent-child communication area social design drawings

Source: Design by author, 2023

(4) Library Design

The reading area adopts the form of a semi-open enclosed space, using glass and bookshelves to form a semi-isolated space, which can, to a certain extent, isolate the interference from the outside world and enable children to focus on reading and learning while being in a quiet space also maintains children's sense of psychological security. The open space in the reading area is filled with a free combination of chairs and stools, allowing children to freely choose how to read or study independently in the reading area (Figure 101).

Figure 101 Library design drawings

Source: Design by author, 2023

4.3.8 Sustainability

The whole interior space consists of four buildings. All four blocks have passageways connected to the outdoors, conducive to light and ventilation, saving building energy consumption and satisfying sustainability. The following is a specific analysis.

4.3.8.1 In terms of space height, the space is high, and natural ventilation and natural lighting are fully considered in the design. The height and volume of the building are reasonably controlled, making air circulation and natural light sufficient.

4.3.8.2 In terms of material selection, environmentally friendly materials are chosen, and environmentally friendly building materials such as rammed earth, bamboo, wood, and stone from renewable resources are used, which reduce the impact on the environment and have a high stability and service life, thus reducing the cost of building maintenance and replacement. Energy-saving measures are also adopted, and the building's exterior walls are equipped with insulation, effectively reducing energy loss.

4.3.8.3 The balanced and sufficient lighting inside the building is fully considered. The design uses suitable façade openings to increase natural indoor lighting, reduce reliance on artificial lighting, and reduce energy consumption. LED lighting is used inside the building to reduce energy consumption.

4.3.8.4 The naturalness and efficiency of ventilation inside the building are fully considered. The design uses appropriate façade window openings and ventilation systems to increase indoor air circulation, improve indoor air quality, reduce reliance on artificial ventilation, and reduce energy consumption. In addition, the permeability and air permeability of the materials is considered in the selection of building materials, which helps to enhance the effect of indoor and outdoor air circulation and improve indoor air quality.

4.3.8.5 **Greening design:** The design uses natural terraces and vegetation to reduce the damage to nature and has good ecological benefits.

4.4 Analysis of Activities Carried out By the Center

From the connotation of the concept of rural characteristics, it can be seen that rural characteristics decompose the overall characteristics of the countryside into three different aspects: natural, cultural, and agricultural (Figure 102).

After investigating the current situation of Cailin Village, the researchers concluded that the courses with potential are as follows: camping courses, practical activities courses, general education courses, art courses, physical education and health courses, social emotion courses, and skill training courses. By embedding the most matching curriculum, it is expected to realize the existing characteristics of the village. Based on the relationship between the course setting of the activity center and the rural characteristic factors, the specific activities of the construction of the activity center are

as follows: nature exploration, outdoor activities, community service projects, learning counseling, art creation, sports, community service, psychological counseling, cultural experience, science and technology Innovation, parent-child participation, health education, handicraft making, weaving, and cultivation.

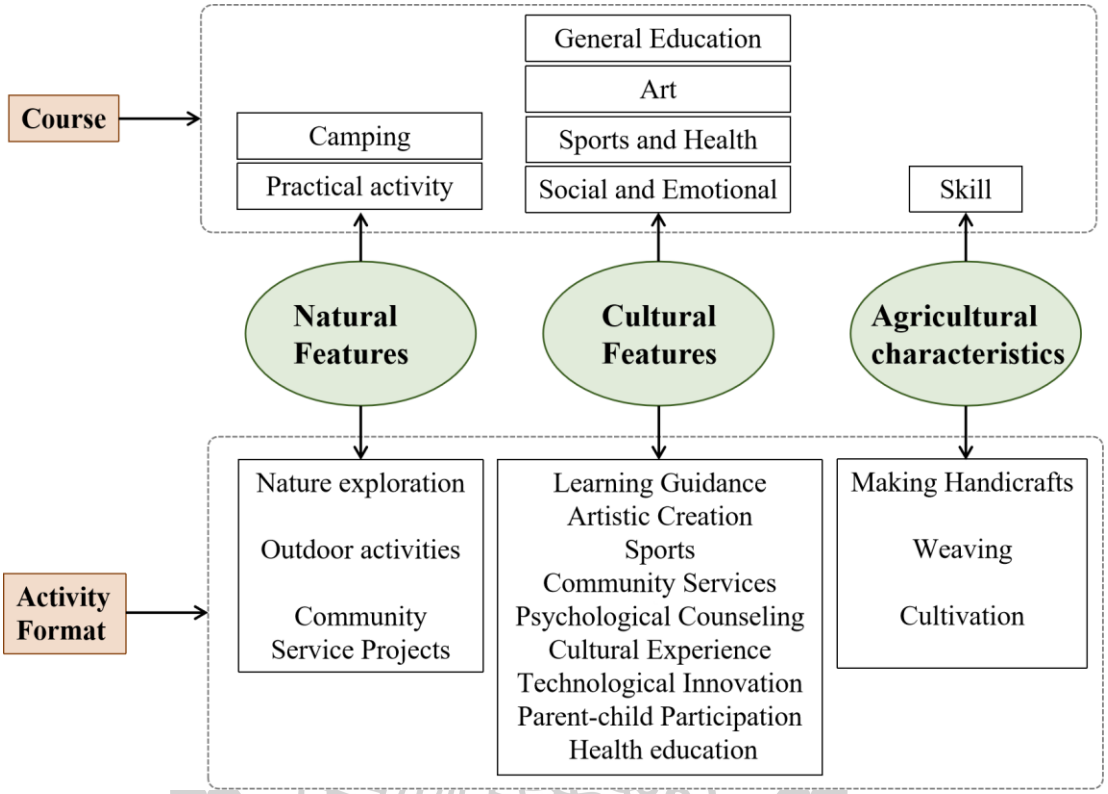


Figure 102 Library design drawings

Source: Self-drawn by the author, 2023

4.4.1 Curriculum Settings

Camping class: Use the abundant water ponds in the village, nearby hills, and other natural resources as a venue for camping survival classes. Common wood and simple structures can spontaneously complete the construction process in the classroom.

Practical activity classes: field trips and outdoor activities Community service projects to develop a sense of social responsibility. Scientific experiments and practical application skills.

General courses: Learn the reading, writing, and oral expression of language and literature. Learn mathematical calculations and problem-solving skills.

Learn about basic science knowledge and experiments. Understand the basic concepts of society and culture.

Art Classes: Take drawing, craft, and art classes. Music and dance performances. Introduction to traditional culture and local culture.

Physical Education and Health Classes: Health Education: Diet, Hygiene, and Exercise. Mental health and emotion management.

Social Emotional Lesson: Teamwork and communication skills. Cultivate trustworthy, friendly, and supportive behaviors: conflict resolution and emotion management.

Skills training classes: Manual skills, such as making handicrafts and weaving. Agriculture and rural life skills Computer and information technology

These courses help left-behind children obtain comprehensive education and skills, enhance their comprehensive literacy, and improve their future quality of life. In addition, courses can encourage them to actively participate in the community and society and develop their leadership skills and social responsibility.

4.4.2 Forms of Activity

Natural exploration, outdoor adventures, rural picking, and ecological inspection activities are organized to allow children to get close to nature and cultivate awareness of caring for and protecting the environment. Provide children with tutoring courses in different subjects through learning tutoring, including mathematics, Chinese, and English. Group or individual tutoring can help left-behind children improve their academic performance and learning ability. In terms of artistic creation, we organize painting, handicraft, paper-cutting, and drama performance art creation activities to cultivate left-behind children's creativity and artistic expression ability. In terms of sports, physical education classes and outdoor sports are organized to promote children's physical health and teamwork spirit.

Regarding community services, children are encouraged to participate in community activities, such as cleaning the activity center environment, helping the elderly, and cultivating a sense of social responsibility and citizenship. In terms of psychological counseling, psychological counseling courses, and group discussions are organized to help children deal with emotional problems and improve their psychological quality. Regarding cultural experience, we organize traditional drama

performances and traditional festival celebrations to let children feel the charm of traditional culture. Regarding scientific and technological innovation, activities such as scientific and technological experiments and programming training are carried out to cultivate children's scientific thinking and innovative abilities. Regarding parent-child participation, parent-child activities are held regularly to allow parents and children to participate together and enhance parent-child relationships. Health education, lectures, and examinations are held to improve children's health awareness and habits.

Regarding handicraft skills, we carry out activity training on handicrafts, weaving, agriculture, and rural life skills, learn about local culture, history, and traditional customs, and inherit traditional skills and handicrafts. In terms of cultivation, you will learn the labor courses of planting and picking crops.

The above activities are designed to meet left-behind children's needs fully, provide them with rich and diverse learning and growth opportunities, and promote their all-round development and healthy growth. These activities will be organized in different ways and forms to allow left-behind children to acquire knowledge, skills, experience, and happiness and cultivate their social adaptability and self-confidence.

4.4.3 Event Planning

These activity programs can be personalized based on a child's academic level, interests, and special needs to provide beneficial after-school activities. Each activity should have clear educational and development objectives so that its impact and effectiveness can be measured. In addition, the activity center can also regularly organize family days or parent-child activities to promote family and community interaction (Table 20).

Table 20 Monday-Friday After School Activity Center Programs

Name of Activity	Activity Time	Activities	Activity Objectives
After-school coaching	Monday to Friday	Provide subject tutoring and help with homework	Improve academic performance, close knowledge gaps, and develop study habits.
Physical culture	Monday, Wednesday	Playing sports such as basketball, football, badminton.	Exercise, improve physical skills, promote teamwork and health awareness.
Art	Tuesday, Thursday	Painting, handicraft making, music, dance.	Developing creativity and artistic interests, and fostering aesthetics.
Scientific experiment	Wednesday, Friday	Conduct simple science experiments such as rocket making	To stimulate an interest in science and to develop experimental and investigative skills.
Social activities	Thursday	Holding social events such as volunteering and social gatherings	Develops a sense of social responsibility and promotes social skills and friendships.
Rural Life Experience	Monday, Friday	Participation in rural life, planting, farming, cookery	To develop practical life skills and knowledge of rural culture and agriculture.
Reading and Writing Club	Tuesday, Wednesday	Engage in literary activities such as reading, writing, and discussion	Improve reading and writing skills and develop literary interests.

These activity programs can be personalized based on a child's academic level, interests, and special needs to provide beneficial after-school activities. Each activity should have clear educational and development objectives to measure its impact and effectiveness. In addition, the activity center can also regularly organize family days or parent-child activities to promote family and community interaction (Table 21).

Table 21 Weekend Activity Center Program

Name of Activity	Activity Time	Activities	Activity Objectives
Nature Discovery Tour	Saturday morning	Outdoor adventure and eco-education at a nearby nature reserve	Enhance awareness of the natural environment and develop environmental awareness and teamwork skills.
Handicraft Creation	Saturday afternoon	Making handicrafts such as beads, pottery, etc.	Develops creativity and craft skills and promotes interest in the arts.
Sports competition	Sunday morning	Holding football, basketball or track and field competitions	Exercise physical fitness and develop teamwork and competitive spirit.
Scientific experiment	Sunday afternoon	Conduct simple science experiments such as the fruit battery experiment	To stimulate an interest in science and to develop experimental and investigative skills.
Rural Life Experience	Saturday all day	Participation in rural life, growing vegetables, raising small animals	To develop practical life skills and knowledge of rural culture and agriculture.
Art	Sunday morning and afternoon	Arts programs in painting, music, dance.	Foster creativity, aesthetics, and interest in the arts.
Community service activities	Saturday afternoon	Participate in community cleaning, elderly companionship and other voluntary activities	To develop a sense of social responsibility and to strengthen the sense of community and the spirit of service.

These activity programs can be adapted to suit the children's season, weather, resources, and age to ensure a fun and rewarding weekend of activities. In addition, each activity should have clear objectives so that its impact on the child's education and development can be assessed.

4.5 The Design Solution Shows the Study's Results and the Target Audience's Satisfaction

4.5.1 Presentation of the Work and Results

From March 20 to 25, 2023, the design was exhibited at Wangjiarong Primary School in Qinglin Township (Figure 103). The exhibition's theme was "Design for a Better Life: Exhibition of Design Results of Activity Centers for Left-behind Children." During the exhibition, a questionnaire assessment on satisfaction with the program design was administered to 165 elementary school kids, and 155 valid responses were gathered.

Exhibition site:

Figure 103 Exhibition site photos

Source: Photo taken by the research team, at Tianyu,2023

4.5.2 User Satisfaction Survey

In the questionnaire of satisfaction with the design work of the left-behind children's activity center, the 6–13-year-old children were researched, and the children filled in the questionnaire on-site and collected the questionnaire data. The questionnaire uses a Likert scale and provides feedback on the requirements of left-behind children, including appearance, interior, facilities, emotion, safety, and overall satisfaction.

The following are the findings of the customer satisfaction survey and assessment analysis (Table 22).

Table 22 Basic information of the research sample

	Items	**Frequency**	**Percentage (%)**	**Cumulative percentage of (%)**
Gender	Boys	73	47.09	47.09
	Girls	82	52.91	100.00
Age	6-7 Years old	30	19.35	19.35
	8-9 Years old	55	35.49	54.84
	10-11Years old	45	29.03	83.87
	12-13 Years old	25	16.13	100
Who do you live with at home?	Father	17	10.97	10.97
	Mother	56	36.13	47.10
	Grandparents	76	49.03	96.13
	Relatives	6	3.87	100
Summation		155	100.0	100.0

As seen from the above table, from the point of view of gender distribution, the sample mainly consisted of "girls," with a total of 82 samples, accounting for 52.91%. The proportion of male samples was 47.09%. Regarding age, the highest percentage was "8–9 years old", with 35.49%. Regarding living care, the highest percentage was 49.03% for "living with grandparents."

The following are the findings of the design satisfaction survey and assessment analysis (Table 23).

Table 23 Target user satisfaction analysis results

Questionnaire Questions	Option	Frequency	Percentage (%)	Cumulative Percentage of (%)
1.Is the exterior of the building to your liking?	Very dissatisfied	1	0.65	0.65
	Discontent	5	2.58	3.23
	Commonly	35	13.55	16.77
	Satisfaction	**43**	23.87	40.65
	Very satisfied	**92**	59.35	100
2.Does the interior design meet the needs of your event?	Very dissatisfied	0	0.00	0.00
	Discontent	3	1.94	1.94
	Commonly	22	14.19	16.13
	Satisfaction	**32**	20.65	36.77
	Very satisfied	**98**	63.23	100
3.Are there a wide variety of entertainment facilities?	Very dissatisfied	1	0.65	0.65
	Discontent	5	3.23	3.87
	Commonly	20	12.90	16.77
	Satisfaction	**47**	30.32	47.10
	Very satisfied	**82**	52.90	100
4.Do you think this activity center's meets emotional needs?	Very dissatisfied	2	1.29	1.29
	Discontent	7	4.52	5.81
	Commonly	21	13.55	19.35
	Satisfaction	**45**	29.03	48.39
	Very satisfied	**80**	51.61	100

Questionnaire Questions	Option	Frequency	Percentage (%)	Cumulative Percentage of (%)
5.Are the social facilities satisfactory?	Very dissatisfied	2	1.29	1.29
	Discontent	9	5.81	7.10
	Commonly	22	14.19	21.29
	Satisfaction	**40**	25.81	47.10
	Very satisfied	**82**	52.90	100
6.Is the ambience warm and comfortable?	Very dissatisfied	5	3.23	3.23
	Discontent	11	7.10	10.32
	Commonly	22	14.19	24.52
	Satisfaction	**46**	29.68	54.19
	Very satisfied	**71**	45.81	100
7. Do you think this activity center can meet the educational needs?	Very dissatisfied	6	3.87	3.87
	Discontent	14	9.03	12.90
	Commonly	22	14.19	27.10
	Satisfaction	**47**	30.32	57.42
	Very satisfied	**66**	42.58	100
8.What is the overall satisfaction with the event center design?	Very dissatisfied	2	1.29	1.29
	Discontent	8	5.16	6.45
	Commonly	22	14.19	20.65
	Satisfaction	**43**	27.74	48.39
	Very satisfied	**80**	51.61	100
Summation		155	100.0	100.0

The following findings were reached based on the target group's structure:

(1) From each group's data, the tested users' satisfaction is high, and the average "satisfaction" index reaches 79.68%. This proves that the research method and program design have achieved the expected goal and completed the satisfaction test.

(2) From the collected data, we can understand the preferences and dissatisfaction of the left-behind children with different design elements to meet their needs better and support the future development direction of this study.

4.5.3 Analysis of Expert Evaluation of Works

4.5.3.1 Expert rating

According to the four-dimensional expert evaluation system, corresponding to the quantitative table of design evaluation standards, seven experts in different fields were invited to evaluate and score the work: architectural design experts, environmental design experts, design experts, regional cultural research experts, child psychology experts, child pedagogy experts, and social workers. The evaluation scores of the seven experts are as follows (Table 24).

Table 24 Expert Scoring

Number	**Degree of conformity to needs**	**Design Solutions**	**Regionality**	**Practicality and sustainability**
Expert 1	10	8	8	6
Expert 2	9	7	7	5
Expert 3	10	7	9	7
Expert 4	9	5	6	5
Expert 5	8	8	5	6
Expert 6	7	5	8	6
Expert 7	8	9	7	7

4.5.3.2 Analysis of Results

Based on the expert's scoring tables and calculations mentioned above, the following specific analysis and evaluation of the design can be performed:

The degree of conformity to needs. The average score of the experts' evaluation of this item is 8.71, which indicates that the design is well recognized and evaluated in terms of meeting the requirements.

The average score of 7 for design solutions shows that there is still space for development and that more emphasis may be put to new thinking and experimentation in the design.

The average score for this evaluation by the regionality is 7.14, which indicates that the design scheme has done an excellent job considering the regional characteristics and cultural heritage. However, it must also explore the local characteristics and culture more deeply.

The average score of 6 from the experts on practicality and sustainability is slightly lower than the first three items, which indicates that the design can be further improved in terms of practicality and sustainability and that the consideration of the environment can be strengthened.

Based on the above evaluation results, the average score of the expert rating index is not lower than 0.7, indicating that the design scheme has been generally recognized and highly evaluated by experts, but it still needs to be further strengthened and improved in terms of practicability and sustainability.

4.6 Summary

The researchers actively studied and attempted solutions to address the numerous demands of left-behind children in the design practice of Hunan regional left-behind children's activity center. We successfully presented the design results to experts and rural schools by organizing an exhibition. Feedback from expert evaluations indicated that the researcher's design was recognized for considering children's needs, regional culture, and sustainability.

The design practice provided the researcher with valuable lessons on balancing educational, recreational, social, and emotional aspects in design and

incorporating local cultural elements. The exhibition's success also proved the design's feasibility and social impact.

However, the researchers also realized that the design field is evolving, and there is still much room for improvement. In the future, we will keep emphasizing the needs of children left behind, look for more innovative design approaches, and continue to improve the functionality and practicality of the activity centers to support the growth of the left-behind children better.

Chapter 5 Conclusion and Suggestions

In the design of the regional Hunan left-behind children's activity center, the researcher summarizes the results and provides outlook and recommendations, and this chapter is divided into six parts:

Part 01: Conclusions after the solution of the three research questions.

Part 02: Different directions were discussed.

Part 03: Innovative research description in constructing an activity center for left-behind children in Hunan.

Part 04: Describe the achievement of the research objectives.

Part 05: Prospects and suggestions for future design.

Part 06: Summary.

5.1 Conclusion

5.1.1 Summary of the Research Questions

5.1.1.1 Summary of the Actual Situation and Needs of Left-Behind Children in Rural Hunan

Actual situation: Children who are left behind lack the company and care of their parents and have more prominent mental health problems; they lack the opportunity to interact with their peers and appropriate after-school activities; and they lack understanding and knowledge of the outside world.

Needs: Through literature research, field surveys, questionnaires, and interviews, the four needs of left-behind children for their living environment are summarized: recreational needs, social needs, educational needs, and emotional needs.

5.1.1.2 Summary of the Functional Needs of the Activity Center

The learning and education functions of the activity center for left-behind children must be met through games and entertainment, socialization and interaction, culture and inheritance, and psychology and emotion. Therefore, the activity center sets up various functional areas: village entrance activity area, nature education area, agricultural experience area, activity center area, and lawn theater area. Specifically, it can be divided into two parts: outdoor and indoor.

Outdoor activity area: village entrance activity area, nature education area, agricultural experience area, lawn theater area, games area, and entertainment area.

Indoor activity area: interactive area, social area, parent-child communication room, science room, library, office, multi-function room, boarding area.

5.1.1.3 Combine the Locality of Hunan with the Activity Center for Left-Behind Children with Hunan Characteristics.

Realized the functional needs: The activity center for left-behind children needs to meet various functional needs. The design has fully considered these needs to provide a comprehensive development environment for left-behind children.

Embodies humanized design: The needs and characteristics of left-behind children have been fully considered in the building and environment, providing them with a warm, comfortable, and loving environment.

Regional characteristics were considered: Regional characteristics are an essential factor to consider in the design process. In the Hunan region, the influence of climate, culture, and tradition on the activity design centers for left-behind children was analyzed in the early stages, and essential elements were extracted to make the design suitable for local left-behind children.

The research findings indicate that during their development, left-behind children face problems with safety, loneliness, and low self-esteem, and the construction of activity centers can provide a safe, warm, and affectionate environment for left-behind children, which helps satisfy their physical and psychological needs and promote their overall development.

5.1.2 The Main Conclusions of this Study

5.1.2.1 In response to the actual situation and needs of Hunan's geographically left-behind children, the architecture and environment design of the activity center should have the characteristics of multi-functionality, affinity, safety, and comfort to meet the needs of different age stages.

5.1.2.2 The design scheme should focus on the layout and spatial planning of the activity center, such as flexible spatial layout, open activity areas, and safe traffic flow lines.

5.1.2.3 The importance of environmental design should be considered to improve the green landscape, lighting, and ventilation. These design elements can improve the activity center's quality and the left-behind children's quality of life.

5.1.2.3 This study proposes a design methodology and an IOC system design evaluation method to help designers better achieve the design goals of the activity center for left-behind children.

5.2 Discussion

By designing experiments and practices, the researcher delved into how to provide left-behind children with an activity center that could meet their multiple needs. The following key points are drawn for discussion:

First, diversified needs. The study emphasized the diversified needs of left-behind children, including educational, recreational, social, and emotional needs. This suggests that activity center design needs to be more comprehensive to meet these different levels of needs.

Second, regional culture integration. Regional culture plays a crucial role in activity center design. Incorporating local cultural elements can help children develop a sense of cultural identity while also promoting the local community's cultural heritage.

Third, educational and psychological support. Activity centers are not just entertainment venues but should also provide educational support and mental health care. This requires specialized faculty to meet left-behind children's academic and emotional needs.

Fourth, interaction and participation. Activity centers should encourage children to actively participate in various activities to develop their social skills and teamwork. This helps to improve children's self-confidence and self-esteem.

Fifth, sustainability and innovation. The sustainability of the activity center is crucial; it should be able to operate for an extended period and continue to improve. There is also a need to encourage innovation to adapt to changing needs and social circumstances.

Considering these discussion points together, the design and operation of activity centers require a combination of factors, including children's needs, geographic

culture, educational support, social interaction, and sustainability. Future research and practice should focus on these aspects and strive to provide better support and services to help left-behind children thrive. Development in this area will require the combined efforts of the government, educational institutions, communities, and families to guarantee that left-behind children receive proper care and assistance.

5.3 Innovations of the Study

5.3.1 Innovation from a Research Perspective

Traditional children's activity centers mainly focus on indoor space. However, this study begins with the demands of left-behind children in a growing environment and discovers that most children's amusement and activities occur outside. Therefore, this study breaks the traditional model of only interior design, combines indoor and outdoor, treats the activity center as an element in nature, makes it integrate with nature, and implants the concept of nature education into the activity center and the countryside, paying attention to the permanence of education and its intrinsic value (Figure 104).

Figure 104 Chart comparing tradition and innovation

Source: Self-drawn by the author, 2023

5.3.2 Innovation in Research Content

There is now a short agenda for more systematic theoretical research on the design approach of activity centers for left-behind children in rural Hunan regions. This study attempts to fill this gap, and at this stage, it proposes the design method of activity centers adapted to the needs of the physical and mental development of left-behind children in rural areas of Hunan Province in terms of spatial planning, architectural design, the creation of spatial environments, and spatial design.

5.4 Achievement of Research Objectives

5.4.1 The current state and difficulties of Hunan's rural left-behind children were investigated using field surveys and questionnaires. Their social, educational, and emotional needs were understood to provide a basis for designing activity centers suitable for them.

5.4.2 Through the study of Hunan's regional characteristics, the leading regional factors of the activity center are summarized. The design reflects the regional characteristics, sets up a natural education area, and can arrange learning of traditional culture indoors and outdoors to provide richer experiences and learning opportunities for left-behind children.

5.4.3 The proposed design approach leads to construction of an activity center program for left-behind children in rural Hunan. It offers a secure, healthy, and pleasant activity space for left-behind children to satisfy their diverse requirements and enhance their overall development.

5.5 Research Outlook and Suggestions

The research on the design of regional activity centers for left-behind children is a systematic process of continuous exploration and development that requires full consideration of the needs and actual situation. Moreover, we can only provide a better environment for them to grow up and facilitate their physical and mental health and overall development through continuous exploration and improvement. In the future, there is a need to continue in-depth research and improvement in the following areas:

5.5.1 Strengthening the Awareness and Concern for Left-Behind Children

Children who have been left behind are a vulnerable segment of society and require more attention and care. This study aims to increase the attention of the state, government, and the community.

5.5.2 Innovative Forms and Ways of Activities

To better satisfy the requirements of left-behind children, further research on creative forms and activity methods can be expanded. New activities, such as interactive games and experiential learning, can be introduced to let left-behind children learn and grow through play and experience.

5.5.3 Expand the Study's Sample Size

This study selected Hunan Province so that the results may be affected by geography and culture. There may be some differences in applicability to left-behind children in other regions. Future research could expand the sample size to include activity centers for children from different regions and cultural backgrounds better to understand spatial design's impact on left-behind children.

5.5.4 Exploratory Research on Other Factors

Future research can strengthen the exploration of other factors, such as teachers and educational methods, to more comprehensively understand the impact of activity centers on left-behind children.

5.6 Summary

By considering the children's multiple needs, the integration of regional cultures, educational and psychological support, social interaction, and sustainability and innovation, the following important conclusions have been drawn:

First, the requirements of left-behind children are multifaceted and extensive. Therefore, activity center design should consider these needs comprehensively to meet their educational, recreational, social, and emotional requirements.

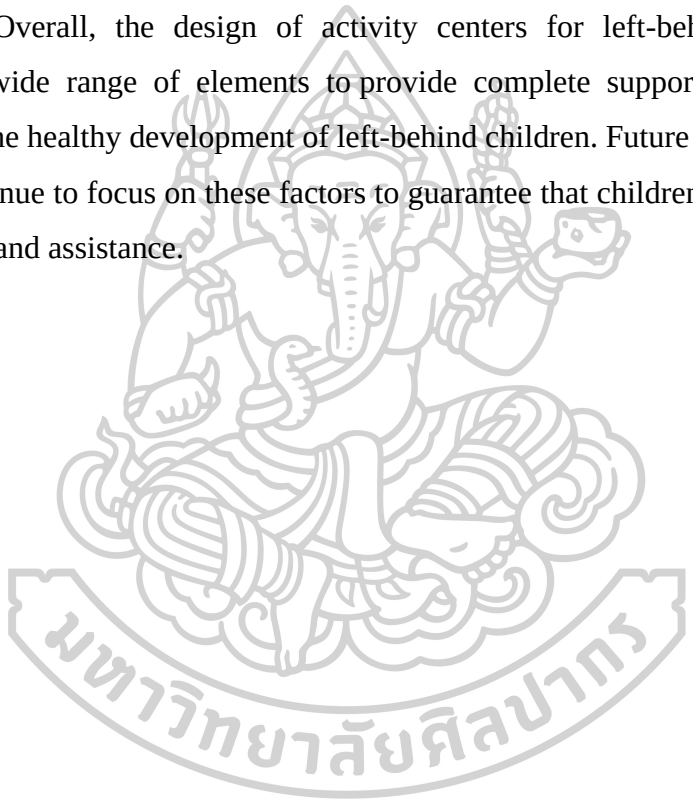
Secondly, local culture plays a vital role in activity center design. Incorporating local cultural elements helps children build a sense of cultural identity and promotes the local community's cultural heritage.

Third, activity centers should provide educational support and mental health care to meet left-behind children's academic and emotional needs. Professional teachers are essential.

In addition, encouraging children to participate in various activities and developing their social skills and teamwork abilities will help improve their self-confidence and self-esteem.

Finally, the design of activity centers should be sustainable and encourage innovation to adapt to the changing needs and social environment.

Overall, the design of activity centers for left-behind children must consider a wide range of elements to provide complete support and services that encourage the healthy development of left-behind children. Future studies and practice should continue to focus on these factors to guarantee that children left behind receive proper care and assistance.



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APPENDICES

APPENDIX A

Public opinion questionnaire on the environment of children's activity space in rural areas（Children）

This questionnaire has been set up to further understand the left-behind children in rural areas. The results of the survey are for academic use only and are confidential. Thank you for your participation.

I. Basic Information

1. Gender: ☐ Boy ☐ Girl

2. Age:

3. Who do you live with at home?

☐ Father ☐ Mother ☐ Grandparent ☐ Relative

☐ Other persons ☐ Living on their own

II. Activities

1. How often do you usually play?

☐ Once or more per day ☐ About three times a week

☐ Once a week ☐ Less than three times a month

2. What is your usual active play time? (Multiple choice)

☐7:00-10:00 ☐10:00-12:00 ☐12:000-14:00

☐14:00-18:00 ☐18:00-20:00 ☐20:00-22:00

3. Do you think there are enough places for children's activities in your village now?

☐ Yes ☐ No ☐ Not sure

4. Who is your guardian when you are out and about? (Single choice)

☐ Parents ☐ Grandparents ☐ Relative ☐ Friends ☐Oneself ☐Others _____

5. Where's your favorite place to hang out? (Multiple choice)

☐ School playground ☐ Children's activity center ☐ Home ☐ Street

☐ Yard and dam ☐ Around fields and ponds ☐ Playing around

☐ Open spaces around home ☐ Other places _____

6. What do you usually do after school/weekend/vacation? (Multiple choice)

☐ Doing housework/farming ☐ Studying ☐ Playing with friends ☐ Watching TV

☐ Physical exercise ☐ Surfing the Internet/playing on cell phone ☐ Other _____

III. Satisfaction with the Current Situation

7. Are you satisfied with the overall event space available in the countryside?

☐ Very dissatisfied ☐ Discontent ☐ Commonly ☐ Satisfaction ☐ Very satisfied

8. Are you satisfied with the available outdoor space in the countryside?

☐ Very dissatisfied ☐ Discontent ☐ Commonly ☐ Satisfaction ☐ Very satisfied

9. Are you satisfied with the existing campus space environment?

☐ Very dissatisfied ☐ Discontent ☐ Commonly ☐ Satisfaction ☐ Very satisfied

10. Are you satisfied with your current home space environment?

☐ Very dissatisfied ☐ Discontent ☐ Commonly ☐ Satisfaction ☐ Very satisfied

IV. Demand for Event Space

11. What is your favorite event space location? (Multiple choice)

☐ Natural Space ☐ Village Streets ☐ School ☐ Home ☐ Other _____

12. What facilities would you like to see in the children's activity space? (Multiple choice)

☐ Game facilities ☐ Fitness facilities ☐ Minor sculptures

☐ Recreational Facilities ☐ Lighting ☐ Others _____

13. What function do you think the event space should fulfill? (Multiple choice)

☐ Social space ☐ Education

☐ Emotional Space ☐ Recreational space ☐ Others _____

APPENDIX B

Public opinion questionnaire on the environment of children's activity space in rural areas（Parent）

This questionnaire has been set up to further understand the left-behind children in rural areas. The results of the survey are for academic use only and are confidential. Thank you for your participation.

1. Is there a dedicated space for children's activities in the countryside where your home is located?

☐ Yes ☐ No

2. If yes, are you satisfied with the event space?

☐ Very satisfied ☐ Satisfied ☐ Commonly satisfied ☐ Not satisfied

3. Do you think the facilities of the activity place are complete?

☐ Very complete ☐ Commonly ☐ Incomplete

4. Is there a children's activity space near your home?

☐Yes ☐No

5. If yes, do you think the event venue is safe?

☐Safe ☐ Commonly ☐Unsafe

6. Do you think the countryside event space is suitable for children to play?

☐ Very suitable ☐ Suitable ☐ Commonly suitable ☐Unsuitable

7. Is there an outdoor activity area near your home?

☐Yes ☐No

8. If yes, do you think the activity place has a beautiful environment and fresh air?

☐ Very beautiful and fresh ☐ Commonly ☐ Not beautiful and fresh

9. Is there an indoor activity space near your home?

☐Yes ☐No

10. If yes, do you think the activity place meets children's activity needs?

☐Very satisfied ☐ Commonly ☐Not satisfied

11. What activity spaces or programs do you think rural children need?

APPENDIX C

Public opinion questionnaire on the environment of children's activity space in rural areas（Teacher）

This questionnaire has been set up to further understand the left-behind children in rural areas. The results of the survey are for academic use only and are confidential. Thank you for your participation.

1. Does your school have an activity area specifically designed for children?

☐Yes ☐No

2. If yes, do you think the activity space meets the needs of children?

☐Very satisfied ☐ Satisfaction ☐Commonly ☐Discontent ☐Very dissatisfied

3. Do you think the facilities of the activity place are complete?

☐Very complete ☐Comparatively complete ☐ Commonly ☐Not complete

4. Do you think there should be more or better places for left-behind children?

☐Yes ☐No

5. Is there a safe playground for children in your school?

☐Yes ☐No

6. Do you think the venue is suitable for children left behind?

☐Very suitable ☐Fairly suitable ☐ Commonly ☐Not suitable

7. Does your school have a place for outdoor activities?

☐Yes ☐No

8. If yes, do you think the activity place has a beautiful environment and fresh air?

☐ Very beautiful ☐ Relatively beautiful

☐ Commonly beautiful ☐ Not beautiful

9. Does your school have an indoor program?

☐Yes ☐No

10. If yes, do you think the activity space meets the children's activity needs?

☐Very satisfied ☐Generally satisfied ☐Not satisfied

11. What new activity places or activities do you think need to be added?

APPENDIX D

Satisfaction Survey on Design Works of Hunan Regional Activity Center for Left-behind Children

1.Is the exterior of the building to your liking?

☐ Very dissatisfied ☐ Discontent ☐ Commonly ☐ Satisfaction ☐ Very satisfied

2.Does the interior design meet the needs of your event?

☐ Very dissatisfied ☐ Discontent ☐ Commonly ☐ Satisfaction ☐ Very satisfied

3.Are there a wide variety of entertainment facilities?

☐ Very dissatisfied ☐ Discontent ☐ Commonly ☐ Satisfaction ☐ Very satisfied

4.Do you think this activity center's meets emotional needs?

☐ Very dissatisfied ☐ Discontent ☐ Commonly ☐ Satisfaction ☐ Very satisfied

5.Are the social facilities satisfactory?

☐ Very dissatisfied ☐ Discontent ☐ Commonly ☐ Satisfaction ☐ Very satisfied

6.Is the ambience warm and comfortable?

☐ Very dissatisfied ☐ Discontent ☐ Commonly ☐ Satisfaction ☐ Very satisfied

7. Do you think this activity center can meet the educational needs?

☐ Very dissatisfied ☐ Discontent ☐ Commonly ☐ Satisfaction ☐ Very satisfied

8.What is the overall satisfaction with the event center design?

☐ Very dissatisfied ☐ Discontent ☐ Commonly ☐ Satisfaction ☐ Very satisfied

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